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HINTS ON HERBORIZING.

BY A. H. CURTISS.

As there are many persons, especially in the country, who desire to acquire a scientific knowledge of the world of vegetation which surrounds them, but who, for the lack of competent instructors, do not know *how to commence*, the following brief directions, offered at the commencement of the floral season, will probably prove serviceable to many readers of the NATURALIST, and may perhaps afford some new ideas to experienced botanists. Any one having a capacity for study may learn the name and natural relationship of any flowering plant by an intelligent use of a good descriptive work on botany—first reading, as a necessary drudgery, an elementary treatise on the structure of plants. But no one can be a good botanist without a good herbarium, which is composed of dried specimens of species and their various forms arranged in systematic order and accurately labelled. The formation of a good herbarium is no simple task, and desultory, unguided efforts will surely be attended with much loss of time and many sources of discouragement.

Scientific characters are taken from the fruit and leaves as well as from the flowers, and often the roots are very important; therefore, a mere sprig of flowers does not constitute a "botanical specimen." A plant not over three or four feet high should generally be preserved entire, doubling it upon itself once or twice if too long for the herbarium sheet—the most approved size of which is eleven and a half by sixteen and a half inches—

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of very large herbs, the upper portion and a lower leaf must suffice, and of shrubs and trees a branchlet. Specimens of most herbs may contain both flowers and fruit, but of most shrubs and trees the flowers are to be collected early in the season and the fruit with mature leaves later. Sedges should be collected only in mature fruit.

Specimens are usually brought home either loose in a tight tin box or pressed flat in folded sheets of thin paper carried in a stout portfolio: but good specimens are more easily prepared by using a portable press. This consists of two light but strong boards half an inch thick, fifteen and a half inches long, and ten and a half inches wide; this size will prevent specimens from being made too large or unnecessarily small. Between these place a pile of driers of the same length and width, each consisting of a sheet of rag paper folded in quarto with a folded sheet of tea paper inside to hold the specimens till dry. Straw paper, however thin, should never be used. The whole is to be bound together with a stout strap, and may have an oil-cloth cover. Arrange each specimen naturally, showing both sides of leaves and flowers, and fold down the upper half of the drier carefully upon it, seeing that the leaves, etc., lie smoothly; carelessness in preparing a specimen is unpardonable, for it may be destined to be preserved for centuries. Next morning transfer the sheets of specimens to the house press, for which there should be provided a great number of driers, about twelve by eighteen inches in size. The best kind of drying paper may not easily be obtained, but newspapers answer very well. The press should be divided by boards into sections, ticketing each to show whether it is to be changed the next day or the day after, and assort the specimens accordingly. Do not take out the specimens till perfectly dry; and, if plenty of driers are at hand, transfer the specimens when nearly dry to another press, and let them remain a week or two; most grasses and sedges, and many other plants, may be transferred to this at the first change. Build up the piles compactly, with thick strips around the edges, so that all may receive uniform pressure from the fifty to seventy-five pounds of weights to be placed on top. Succulent plants may be dried quickly by placing them in a separate press near a stove; the heat may be so great that a thick specimen at top will dry in a day, but care should be taken to remove them as soon as dry. Besides Monocotyledons and Saxi-

frageæ this treatment should only be applied to plants that incline to mould or fall to pieces (Coniferæ are not benefited by it). To dry the damp driers effectually without spreading them all over the room, cut a hole in one end of each and string them on a stout wire and suspend this on hooks set in the under-side of a shelf. Pieces of stiff paper with a slit in the middle are useful for confining specimens of sedges, etc., where bent, and folded pieces of oiled paper for adhesive flowers, etc.; also rings of cotton for thick heads of ligulate Compositæ. The color of plants is best preserved by rapid drying, but not much attention should be paid to this point, as they will fade in a few years. If such plants as the purple Arisæma and Symplocarpus or an orange Lilium be dried in a few minutes by *ironing* them in their driers, they will look when mounted like paintings.

Specimens may be mounted for the herbarium on sized paper with glue, or on unsized paper with touches of poisoned paste and strips of gummed paper. Never mount a small specimen on the centre of a sheet, nor any specimen without first poisoning it, which is done by washing with an alcoholic solution of corrosive sublimate just weak enough not to show. A pile of duplicates, if infested with insects, should be inclosed for a while in a close vessel with an ounce or two of chloroform or cyanide of potassium. A few grains of the latter introduced into a case of entomological specimens will quickly destroy all intruders. It is best to keep each genus in a manilla cover and these in piles on the shelves of a cabinet.

The earliest flowering plants being on the whole most difficult, the beginner will meet with many discouragements at first; but every step will add to his strength. Any locality will afford from five hundred to eight hundred species of flowering plants, and, in determining so large a number, mistakes are inevitable; therefore, it is well to send a set of specimens, numbered to correspond with one retained, to some person having a good herbarium, who will doubtless be willing to examine and name them in return for the specimens. The same may be done if the determination of names is not attempted at all, but great care should be taken to see that the two sets exactly correspond, for there is great danger of confounding closely related species, as also of mistaking marked forms for different species.

The plants of other sections may be easily obtained by ex-

changing with other collectors. A person before commencing this system should procure the "Naturalists' Directory" and the "Catalogue of Plants" from the Naturalists' Agency at Salem, to which it would be safest to apply for the best works to be studied.

If one expects to collect year after year for exchange, it is very advantageous to keep a record of the time when the best specimens of each species are to be obtained, which will be found to be an invaluable aid in following seasons. System in scientific work is of the greatest importance, and with this and patient perseverance and economy of time, great results may be accomplished.

USE OF THE RATTLES OF THE RATTLESNAKE.

BY J. G. HENDERSON.

It seems that the singular structure from which the subject of these notes derives its name, was intended as a special stumbling block in the path of antidarwinists, or to intensify the "struggle for existence" which the Darwinian theory, like all other theories must undergo.

In most notices I have seen of the rattles of the rattlesnake, they have been mentioned as though they were of no advantage to the possessor, and that natural selection would never produce them but on the contrary would weed them out, if that theory were correct. It seems to me that the whole trouble in the matter arises from the assumption that the sound of the rattles, as a war-cry, is a disadvantage to the reptile, by calling the attention of its enemies to it and thus inviting its own destruction, and that consequently the only way to reconcile the existence of the rattles with the theory of Darwin, is to show that there is some other use made of them and that in striking the balance between the profit and loss sides of the ledger, the line falls on the side of the former and for that reason natural selection produced and retains the rattles. If I understand him rightly, this is the view of the matter taken by Prof. N. S. Shaler in his paper in the January NATURALIST. He says that for some years he has "been teaching that the tail appendage of the rattlesnake was not to be explained

upon the theory of natural selection, inasmuch as it could contribute in no way to the advantage of the animal; that it seemed to him quite clear that it was rather calculated to hinder than to help the creature in the race of life by warning its prey of its presence." But he intimates that he is now ready to say, that this appendage can be explained upon the theory of natural selection. He considers the idea that it might be used as a sexual call as untenable, but that the whirring sound of the rattles closely imitates the sound made by the Cicada and for this reason is used as a call-note, as a hunter uses his bone-turkey-caller, to induce the bird to come within the range of his weapon. Now the first question which naturally arises is this: Does the snake sound its rattles when seeking to capture its prey? I have always understood that it is only when it throws itself upon the defensive and prepares for battle that the rattles are sounded; that it is an alarm note, a war-cry, and not a gentle, deceptive invitation to the victim. I have never seen a rattlesnake, and know of course nothing personally of its habits. But if this use is not made of the rattles as suggested by Prof. Shaler, and the sound only serves to call the attention of its enemies and thus invite destruction, then indeed is the theory of natural selection nonplussed. But as I view the matter, instead of inviting his destruction by sounding the rattles, it is one of the most effective means of self protection and is as useful to it in the race for life as is the growl of the tiger when threatened with danger. The snake does not sound its rattles until it considers itself discovered, and not then unless it apprehends danger. It throws itself in position to strike and says in unmistakable language, "Look out, I am ready for you!" If pushed upon, it makes its leap at its antagonist, and again throws itself in position to renew the conflict, and again sounds the note of defiance; a note calculated to alarm and, like the war-whoop of the Indian, strike terror to the heart of the assailant; but it may be said that the Indian only utters his yells when rushing on his enemy, or when actually engaged in the conflict, and the sounding of the rattles upon the first approach of danger is a disadvantage. Now it seems to me, if this were true and if it be a piece of rashness upon the part of the snake thus early to exhibit his combatativeness, that natural selection would cure the matter by selecting and preserving the more timid, and that, eventually, rattlesnakes would only sound their tail-bells when it would best promote their interests.

We are not to judge of the advantage or disadvantage of the rattles by their effect upon the nerves of man alone, though no doubt many a man has turned his back and been deterred from making an attack by the sound of these rattles and the defiant attitude of their possessor.

The ability of the snake to defend itself does not consist in its strength or size, or in its power of overcoming its adversary by a prolonged conflict, for most of its enemies are its superior in size and strength. Nor does its deadly poison act quickly enough to secure its own safety when it is attacked, but, in most cases, the victim, after the deadly stroke is given may still revenge itself by the destruction of the snake. But the *certainty* of the effect of the poison serves as a warning and is advantageous, not in defense after the attack is made, but in *preventing* an attack from being made. If, then, the color of the rattlesnake were different from all harmless snakes, so much so as to render it conspicuous, this would be beneficial to it, by the readiness with which all animals would recognize it, and thus protect the snake by this notice of the deadly character of its weapons. If then a conspicuous color would be of advantage, it seems to me that any other means which it may be able to use in making known its character to any animal that may come near it, would be advantageous, and would be increased and preserved by natural selection, and that the whirring noise which it produces, in this view of the matter, admirably serves its purpose. In effect it amounts to this, and by experience its enemies learn to understand its language, "I am a *rattlesnake*, armed with what will be death to you if you come too near; give me a wide berth!"

Prof. Shaler remarks that it is a fact well known doubtless to those who have observed serpents, that many when in a state of excitement vibrate the end of their tail just as the rattlesnake does. This statement reminded me of a South American species described by Darwin in his "Voyage of a Naturalist" (vol. i, p. 123, Harper's ed.), where he says:—

"Of reptiles there are many kinds: one snake (a Trigonocephalus, or Cophias), from the size of the poison channel in its fangs, must be very deadly. Cuvier, in opposition to some other naturalists, makes this a sub-genus of the rattlesnake, and intermediate between it and the viper. In conformation of this opinion I observed a fact, which appears to me very curious and instructive, as showing how every character, even though it may

be in some degree independent of structure, has a tendency to vary by slow degrees. The extremity of the tail of this snake is terminated by a point, which is very slightly enlarged; and as the animal glides along, it constantly vibrates the last inch; and this part striking against the dry grass and brushwood, produces a rattling noise, which can be distinctly heard at the distance of six feet. As often as the animal was irritated or surprised, its tail was shaken; and the vibrations were extremely rapid. Even as long as the body retained its irritability, a tendency to this habitual movement was evident. This Trigonocephalus has, therefore, in some respects, the structure of a viper, with the habits of a rattlesnake; the noise, however, being produced by a simpler device."

It was these remarks of Darwin that first suggested the problem of the rattlesnake's tail to my mind, and, as I had thought considably about the matter, of course I was deeply interested in the paper by Prof. Shaler; but I must acknowledge that, while many of his suggestions are correct and highly valuable, I was disappointed to find that the only advantageous use, in his estimation, of this tail appendage of the rattlesnake, is an imitative call-note to allure birds within its reach, and that, otherwise, it is rather a disadvantage than an advantage to be preserved and perfected by natural selection. If it is useful for both purposes, then there is a double reason for the action of natural selection. If it is not used as an imitative call-note, but is useful in the manner I have pointed out, then I have shown that it is explained by natural selection.

ORNITHOLOGICAL NOTES FROM THE WEST.

BY J. A. ALLEN.

I. NOTES ON THE BIRDS OF KANSAS.

In the spring of 1871 an expedition to the Plains and the Rocky Mountains was sent out by the Museum of Comparative Zoölogy, under the charge of the writer. During the nine months spent in the field by the party in question, the department of ornithology received a large share of attention. In the following pages it is proposed to give a hasty résumé of such observations

as may be supposed to interest the ornithological readers of the NATURALIST, reserving a more detailed and formal report for publication elsewhere.*

Leavenworth, Kansas, was the point at which we commenced our labors. During the ten days spent at this locality we collected or observed nearly one hundred species of birds. Although we arrived here May 2d, the country wore the aspect of a New England June. The prairies were already green with waving grass and the forests were nearly in full leaf. The apple trees were some days out of bloom, and the young cherries were as large as very large peas; the vegetation being fully a month in advance of its usual stage in Southern New England at the same date. Comparatively few of the birds, however, were nesting; some had not arrived from the South, and others whose breeding stations were more to the northward still lingered.

We found in the vicinity of Leavenworth a collector's paradise, the forests of the Missouri bottom-lands literally swarming with birds, many of which none of the party had before seen in life, the general aspect of the ornithological fauna being strikingly diverse from that of the northeastern states. The red-headed and red-bellied woodpeckers (*Melanerpes erythrocephalus* and *Centurus Carolinus*) revelled among the grand old elms and cottonwoods of the bottom-lands, some of which tower to the height of one hundred to one hundred and fifty feet. The golden-shafted flicker (*Colaptes auratus*) was almost equally abundant, and showed its close affinity with its red-shafted brother of the mountains and the Pacific Slope (*C. Mexicanus*) by already frequently presenting touches of red in its black cheek patches. Although the hairy and downy woodpeckers (*Picus villosus* and *P. pubescens*) were both observed, they seemed by no means common. The crested titmouse (*Lophophanes bicolor*) and the merry cardinal (*Cardinalis Virginianus*) vied with each other in their noisy demonstrations, both being exceedingly abundant and garrulous. Their vocabulary seemed inexhaustible, as they every day astonished us with new sounds, which we often at first supposed to proceed from some bird hitherto unknown to us. The blue jay (*Cyanura cristata*) was equally

*This report will embrace annotated faunal lists for eight localities, with a general summary list for the whole. Mr. C. W. Bennett accompanied the expedition as taxidermist, and Mr. Richard Bliss as ichthyologist, both of whom, especially the former, greatly aided in the ornithological work.

at home, and as vivacious and even more gayly colored than at the north. While he seemed to have forgotten none of the droll notes and fantastic ways one always expects from him, he has here added to his manners the familiarity that usually characterizes him in the more newly settled parts of the country, and anon surprised us with some new expression of his feelings or sentiments,—some unexpected eccentricity in his varied notes, perhaps developed by his more southern surroundings. The yellow-breasted chat (*Icteria virens*) disported himself among the tangled underbrush, and seemed highly to enjoy the discomfiture to which he often put us, through his well-known ventriloquial accomplishments, in our search for his exact whereabouts. The Carolina wren (*Thryothorus Ludovicianus*) was more or less common, and already had young full-fledged on our arrival, while the only other birds then found breeding were the cardinal, the towhe and the brown thrush. Most of these, however, were still pairing and nestbuilding. The common chickadee (*Parus atricapillus*) and the house wren (*Troglodytes ædon*) were both common, but were far less numerous and much more retiring than their more demonstrative southern relatives already mentioned.

Among the warblers three southern forms were the most common, their bright colors often attracting the eye as they flitted through the openings among the trees. These were the Kentucky (*Oporornis formosus*), the hooded (*Wilsonia mitrata* Bon.) and the blue-winged yellow (*Helminthophaga pinus*). They seemed aware that they were especial objects of attention to the collector, and took good care not to exhibit themselves unnecessarily. The golden-crowned warbler (*Helminthophaga celata*) was also one of the most numerous of the *Sylvicolidæ*. The Nashville (*H. rubricapilla*), the blue yellow-backed (*Parula Americana*) and the black and white creeper (*Mniotilta varia*) were likewise moderately frequent. The beautiful cærulean warbler (*Dendræca cærulea*) was met with a few times, the Blackburnian (*D. Blackburniæ*) once or twice, and the yellow rumped (*D. coronata*) but once, though the latter was doubtless common somewhat earlier in the season. The yellow warbler (*D. æstiva*) was more or less common along the outskirts of the forests; the chestnut-sided (*D. Pennsylvanica*) was by no means rare; redstarts (*Setophaga ruticilla*) were seen but a few times, and the Maryland yellow-throat (*Geothlypis trichas*) was far from numerous.

Of thrushes, by far the most common was the wood thrush (*Turdus mustelinus*), which was abundant. Although it was the pairing season, they were comparatively quite unmusical, their song being shorter, and, it seemed to me, far inferior to that of the representatives of this species at the North. The birds were also much less wary, being easily approached. I shot five or six in half an hour during one of our excursions, and might have easily got as many more had not rarer species more especially attracted my attention. The olive-backed thrush (*T. Swainsonii*) was also common, but save the brown thrush (*Harporhynchus rufus*) and the catbird, which were both tolerably numerous, no other thrush, not even the robin, was met with. The common eastern bluebird (*Sialia sialis*) was frequent, especially near the borders of the forests.

Of vireos, three species only were seen, — the red-eyed, the warbling and the white-eyed, all of which were moderately and about equally frequent. The logger-headed shrike (*Collurio Ludoviciana*) was occasionally seen, generally along the edges of the prairie.

Harris's finch (*Zonotrichia querula*) was, next to the cardinal, the most abundant species of the family of sparrows and finches, as it was also one of the largest and handsomest. It almost exclusively frequented the damper parts of the woods, associating with the white-throated sparrow (*Z. albicollis*), much resembling it both in habits and song. The white crowned (*Z. leucophrys*) and Lincoln's sparrow (*Melospiza Lincolnii*) were each a few times met with. The song sparrow was scarcely observed; the swamp sparrow was common, as were also the chipping and field sparrows. The beautiful lark finch (*Chondestes grammaca*) was among the rarer species. The towhe was numerous and the indigo bird (*Cyanospiza cyanea*) made its appearance in considerable numbers soon after our arrival. The black-winged red bird, or scarlet tanager, was the only representative we saw of the tanagers. It was, however, abundant, and though so gorgeously arrayed at the north, the intensity of its colors was appreciably greater here.

Of the *Icteridæ*, the Baltimore and orchard orioles were both abundant, the Baltimore indulging in a dialect so different from that of its northern relatives as often to puzzle us to make out to what bird its strange notes belonged. Its colors, also, were

unusually bright in all the specimens examined. The red-winged blackbirds and the purple grackle (*Quiscalus purpureus*) were both numerous, the latter presenting the brassy tints somewhat peculiar to the western race of this flexible species. The lazy, ubiquitous cowbird (*Molothrus pecoris*) was ever lurking in the trees and bushes, watching for an opportunity of shirking the burden of hatching and rearing its young upon some more industrious neighbor, wholly oblivious of respectability and fair play in respect to its domestic affairs. On the prairies the meadow lark (*Sturnella Ludoviciana*) filled the air with the wild, sweet melody so characteristic of this bird in the prairie states.

Among the swallows, the purple martin (*Progne subis*) was one of the most numerous, breeding in all parts of the city in boxes liberally provided for their accommodation. This bird seems to be a universal favorite in the more newly settled parts of the west, the erection of martin boxes being one of the settlers' first "improvements." Hence this bird is often common where none could exist without man's kindly aid. The barn, cliff, white-bellied, bank and rough-winged swallows were also more or less common. The swift (*Chætura pelasgia*) was quite numerous, breeding chiefly in the hollow trees of the forest, which it always seems to prefer to chimneys, to which it has to resort in most of the longer settled districts, or else abandon the country.

The Carolina dove was abundant almost everywhere; the quail (*Ortyx Virginianus*) was equally numerous, but affecting chiefly the neighborhood of thickets. The prairie chicken still forms the chief game bird of the prairies.

Of birds of prey few were observed beyond such almost universally common species as the marsh hawk and the sparrow hawk. The latter was nesting abundantly in woodpeckers' holes in the forests. Between this bird and the red-headed woodpecker we witnessed many fierce encounters, the woodpecker being usually the aggressor, but by no means always the victor.

The few water birds seen were chiefly of the following species: spotted and solitary sandpipers, both common; the lesser tell-tale or "yellow legs" (*Gambetta flavipes*) and the red-backed sandpiper (*Pelidna Americana*) were also quite numerous about the lagoons, which were also inhabited by an abundance of "mud hens" (*Fulica Americana*), and frequented by teals, mallards and wood ducks. Our stay being so short at this interesting locality, many birds

were doubtless to be found here of which we met with no examples.

Leaving Leavenworth, our next stop was at Topeka, where we also tarried for ten days, devoting the time almost exclusively to ornithologizing. Here also we observed about one hundred species, including a few not met with at Leavenworth, while some birds that were among those most numerously represented there, were not seen at Topeka. Among those especially missed was Harris's finch, and among the new forms Bell's vireo, Nuttall's whippoorwill and the yellow-headed blackbird were the most noteworthy. As Bell's vireo did not appear here till some days after our arrival, it may be expected to be equally numerous at Leavenworth, as the ornithological fauna of the two localities is essentially identical, the distance between them being less than a hundred miles, and both being in nearly the same latitude.

At no point have I ever met with birds in greater abundance than at Topeka, either in individuals or species. On the day of our arrival there I counted, during a half hour's stroll in the woods near the town, about thirty species, of most of which I observed several individuals, whilst several of them were extremely abundant. This may result from the trees being restricted to a narrow belt along the Kaw river, thus crowding all those more or less restricted to a timbered country into a comparatively limited area. The trees here are smaller than along the Missouri, less crowded, and with a thicker undergrowth. Considerable areas were covered with quite young trees, forming, with the dense undergrowth of hazel, dwarf oak and sumach bushes almost impenetrable thickets: and the forests were broadly fringed with a dense growth of these bushes, extending at times far out on the prairies. These brush patches were the favorite haunt of the yellow-breasted chat, the black-throated bunting and the several species of *Spizella*, among which we here first met with the *S. pallida*, or clay-colored sparrow. The chats were so abundant that three or four to half a dozen would be sometimes seen hovering and singing in the air at once, each striving to outdo the other, in grotesque manœuvring and in song, while a dozen or two black-throated buntings would be also in sight or hearing engaged in a similar vocal rivalry. Although the males of the latter species were so numerous, a female was rarely seen. Whenever one ventured into sight the males would most ungallantly start in

pursuit of her, and oblige her to seek concealment again,—a treatment similar to that indulged in by the bobolink toward his "better half." The thinner portions of the wooded area were the favorite haunts of Bell's vireo, which immediately upon its arrival became one of the most numerously represented species. They very soon commenced pairing, the males almost incessantly uttering their rather pleasing though peculiar and feeble song.

Among the other later arriving birds was the golden-crowned wagtail (*Seiurus aurocapillus*) and the swallow-tailed kite (*Nauclerus furcatus*). The former appeared on the 15th of the month (May), and immediately the woods were ringing with its familiar song. The arrival of this bird so late in the season was quite unexpected, the trees being not only in full leaf, but vegetation generally was quite far advanced, strawberries being already ripening in abundance in the fields, whilst for days the temperature had been that of July in southern New England. This interesting little woodland songster is pretty sure to make his appearance in Massachusetts with the earliest unfolding of the leaves, arriving there rather earlier than we this year observed it to appear in Kansas.

At this place we saw the only robins—a single pair—and the only cedar birds (one or two small flocks) met during our sojourn of over two months in the state of Kansas. The blue-gray gnatcatcher (*Polioptila cærulea*) was here also met with once, and the only time in the State.

Leaving Topeka May 24th, we arrived the following day at Fort Hays, situated some three hundred miles west of the Missouri river, and fairly out on the "Great Plains." The only timber found here consists of a somewhat interrupted fringe of elms, box elder and cottonwoods along the streams, and this entirely disappears a few miles further to the westward. We hence have here all the characteristic birds of the plains, in addition to many eastern species that follow the timber up the streams as far as timber regularly extends, even after the timber belts become extremely restricted and irregular. Remaining five weeks in the vicinity of Fort Hays enabled us to become thoroughly familiar with the ornithology of this peculiar region, our excursions extending in different directions from fifteen to thirty miles from the Post, which, through the hospitality of the officers in command, formed our headquarters and base of operations.

When we arrived here the plains were everywhere covered with a carpet of short fine grass, varied with large patches of brightly-colored flowers,—yellow, orange and various shades of red and purple,—forming a landscape beautiful beyond description. Gradually the earlier plants passed out of bloom, the hot dry winds of June parched and withered the grass, and when we left, the first week in July, only the belts of deep green formed by the foliage of the trees along the streams, presented anything agreeable to the eye, these being doubly refreshing from their contrast with the almost desert-like aridity surrounding them. The daily maximum temperature ranging during our stay from about 90° to 108° F. in the shade, the reader may readily perceive the semi-tropical character of the summer climate of the Plains.

The total number of species observed here was sixty-one, about ten per cent of which were by no means common. Among the species inhabiting the timber, the kingbird, the Arkansas flycatcher (*Tyrannus verticalis*), the purple grackle, red-headed woodpecker and the Baltimore and orchard orioles were by far the most common, all of which in fact were numerously represented. The brown thrush, the mockingbird, the black-headed grosbeak (*Guiraca melanocephala*), the chickadee (*Parus atricapillus*), the golden-shafted flicker, the warbling and Bell's vireos, and the common wren (*Troglodytes ædon*) were all more or less frequent. The kingfisher was occasional, and the Carolina dove everywhere abundant, far out on the Plains as well as in the vicinity of the timber. The rough-winged swallow was also common, and colonies of the cliff swallow were met with breeding on the cliffs in the vicinity of the streams. A few purple martins were seen near the Post; night-hawks were abundant, resting on the trees during portions of each day, and breeding out on the plains. They were mostly of the pale variety commonly known as *Chodeiles Henryi*, but different specimens varied greatly in color, some being nearly as dark as eastern ones. The cowbird was seen far out on the Plains as well as in the timber, but was nowhere numerous.

The birds that may be regarded as characteristic of the Plains were chiefly the following: the meadow lark (*Strunella Ludoviciana*) everywhere abundant, representing typically the pale form of the Plains known as *S. neglecta*. Its notes, however, were quite different from those of the representatives of this species living

to the eastward in the prairie states, being less varied and ringing, and more guttural. The horned lark was equally characteristic, being by far the most numerous species here met with. During the excessive heat of midday it was seen crouching with half open wings in the shade of some tussock of herbage; whilst in winter, when it is equally abundant, it is not uncommon to meet with considerable numbers that have died of the extreme cold, as was the writer's experience the past winter. The yellow-winged sparrow is also one of the most abundant species. The pine wood finch (*Peucea æstivalis*) of the South Atlantic and Gulf States, or rather the representative of that species, was quite frequently met with near the streams, where its sweetly modulated song greets the ear with the first break of dawn, and is again heard at night till the last trace of twilight has disappeared. It is here very appreciably paler than the race of *P. æstivalis* found in the pine barrens more to the eastward, though not otherwise sensibly different. It here constitutes the variety of this species known in the books as *P. Cassinii*. The lark finch (*Chondestes grammaca*) was also common, but affected chiefly the vicinity of the streams and damp hollows. The yellow-headed blackbird, whose biography was so well written sometime since in the NATURALIST* by Dr. Coues, was also a few times met with. But by far the most interesting species were the chestnut-collared bunting (*Plectrophanes ornatus*) and the lark bunting (*Calamospiza bicolor*), because both are not only characteristic of the region, but they are among the few birds strictly confined to the arid plains. Both were quite abundant, but were only met with on the high ridges and dry plateaus, where they seemed to live somewhat in colonies. At a few localities they were always numerous, but elsewhere were often not met with in a whole day's drive. They were rather wary, and very tenacious of life, often flying long distances when shot through vital parts. Most of the many specimens procured by us had to be killed on the wing at long range. Both are strong fliers and seem to delight in flying in the strongest gales, when all the other birds appear to move with difficulty and generally lay concealed among the grass. Both sing while on the wing, the lark bunting hovering in the wind, and shaking its tail and legs after the well known manner of the yellow-breasted chat. Indeed its song strongly

* Am. Nat., Vol. v, p. 195.

resembled the song of the chat, with which at such times its whole demeanor strikingly accords.

Among rasorial birds, the quail and the prairie chicken, both very recent emigrants, it is said, from the East, were occasional, and here reach their present western limit. The wild turkey is still abundant along all the more heavily wooded streams. The sharp-tailed grouse is also common, especially to the northward of Fort Hays.

Hawks were by no means numerous, excepting perhaps, the marsh hawk, which was moderately frequent. A single pair of duck hawks (*Falco peregrinus*) was found breeding on a cliff near the Saline, and one nest of the red-tail was found. Sparrow hawks were also occasionally seen near the timber, and a single pair of ravens was observed. The black vulture (*Cathartes aura*) was also frequent but far less numerous than would naturally be expected, from the abundance of food afforded them by the thousands of carcasses of decaying buffaloes that are scattered over the plains. The little burrowing owl (*Athene hypogea*) was seen at intervals, living in colonies in the prairie dog towns.

Water birds were few, the only ducks seen being a few representatives of the wood duck and the green-winged teal. The spotted sandpiper was more or less frequent along the streams, but the killdeer plover was by far the most numerous representative of the *Grallæ*. The so-called "mountain" plover was also occasional, and generally seen on the dry prairies far away from the streams and sloughs. A single stray representative of the Esquimaux curlew (*Numenius borealis*) and a single small colony of the long-billed curlew (*N. longirostris*) were also observed, the latter breeding. The only herons seen were one or two examples each of the little green heron and the night heron.

A few weeks passed near Fort Hays, in mid-winter, enables me to add a few notes respecting the winter birds of the Plains. One species only of the summer birds was met with in numbers in winter. This was the horned lark which was exceedingly numerous. The snow bunting was also abundant, and the Maccown's longspur (*Plectrophanes Maccownii*) tolerably frequent. The tree sparrow was occasional along the streams wherever there were bushes; the rough-legged buzzard was the most common hawk. None of the remaining twenty-four species of the total number of thirty observed, were numerously represented, and

were such as from their general known distribution would be expected here. Neither the bluebird nor the meadow lark was observed, but the kingfisher and golden-shafted flicker were both occasional.

In conclusion, some peculiarities in the nesting habits of some of the birds observed in Kansas are worthy of notice. A nest of the purple grackle was found in an old woodpecker's hole. Although this is the only instance of the kind I have as yet observed, my friend Mr. Wm. Brewster, of Cambridge, informs me that he has repeatedly found the same species breeding in woodpeckers' holes in Maine! The Carolina dove generally bred at Fort Hays in trees, as at the eastward; sometimes, however, laying in an old grackle's nest instead of being at the trouble of building one. One nest, however, was found *on the ground*, although bushes were growing but a few yards distant. More to the westward I learned that this bird—more common here than at the east—*always breeds on the ground*, as it is of course compelled to do, owing to the absence of either trees or bushes. Meeting with this bird in pairs in the breeding season far out on the Plains, sometimes ten miles from the nearest trees, led me to believe that this would be its habit, even before I had seen positive evidence that such was the case.

Other interesting instances of the modification of nesting habits may well be mentioned in this connection. The brown thrush is well known to vary the location of its nest according to the nature of the soil, nesting on the ground in sandy districts, and in bushes where the soil is damp or clayey. Among the clayey bluffs at Leavenworth we found it nesting in bushes; at Topeka on the ground; at Fort Hays in bushes, when breeding on high ground, and in trees, ten to fifteen or twenty feet from the ground, when nesting in the timber along Big Creek (a considerable stream on which Fort Hays is situated). We had an ample explanation of this latter departure from its usual habits during our stay at Fort Hays. Big Creek, flowing in a deep narrow bed, is subject, in summer, to sudden freshets, resulting from occasional heavy rainfalls, it rising sometimes ten or a dozen feet in a single night, as we once witnessed. The trees growing chiefly along the bed of the stream, the water at such times submerges not only the scanty underbrush, but all the lower branches of the trees. Hence the brown thrush, as well as all the other birds, appears here always to

select high nesting sights. Can such foresight be regarded as the result of "blind instinct?" As the highwater line is always indicated by the drifted matter lodged in the trees, is not this precaution the result rather of a rational appreciation of the exceptional dangers here to be guarded against, and this caution in the selection of a safe nesting site really the result of induction?

The cliff swallow (*Hirundo lunifrons*) we found breeding throughout the West in its primitive way, that is, on the faces of cliffs; yet where such natural facilities abounded they in some instances abandoned the rocks for the more sheltered nesting sites afforded them by buildings, plastering their mud dwellings against the building under the projecting eaves. At Topeka, however, we saw cliff swallows frequenting the *holes in the banks* of the Kaw River made by the sand martin, keeping in the company of these birds, entering their holes and presenting the same appearance of breeding in them as the sand martins themselves! Throughout the mountains of Colorado we found the violet-green swallow (*Hirundo thalassina*) breeding in abandoned woodpeckers' holes; but in the "Garden of the Gods", near Colorado City, they were nesting in holes in the rocks. We had good evidence also that the sparrow hawk bred there in the same manner, — in holes in the cliffs instead of in hollow trees! At Ogden, Utah, we found the red-shafted flicker frequenting holes in a high bank, and that these holes entered horizontally for a few inches only and then turned abruptly downward, having the same form they would have if made by this bird in a decayed tree. These circumstances left no doubt in our minds that these birds nested in the holes in the bank we saw them entering, although it was then past the breeding season. The region being but scantily wooded for many miles, there is certainly some reason for such a modification of their habits. While on this subject I may add that every collector must have noticed how much birds vary the material used in the construction of their nests with locality, using generally whatever is most easily obtained that is serviceable. Nests of the same species from different localities hence often differ greatly in appearance, enabling one sometimes to determine approximately the locality whence the nest came by the materials used in its construction.

Finally, I wish briefly to notice some peculiarities in the color of the plumage of the birds inhabiting the Plains. From

the extreme dryness of the atmosphere, the want of shelter from the intense rays of the sun — an intensity one can hardly appreciate until he has passed a few summer days far out on the Plains — and the dry, heated powerful winds so constant here, few would be surprised at the faded, bleached and worn plumage that characterizes the birds of the Plains. It is more noticeable of course in those that do not frequent the timber, though more or less apparent in all. Here the common "house" wren is bleached and faded, forming the so-called *Troglodytes Parkmanni*, differing from the *T. ædon* of the east only in this particular. The meadow and horned larks look singularly "weather worn," the former constituting the *Sturnella neglecta* of authors, and the latter the *Alauda rufa* of Audubon, in which the yellow almost entirely disappears from the forehead, throat and lores, fading to white. The night-hawk becomes much lighter and paler, forming the race known as *Chordeiles Henryi; Peucea æstivalis* wears a very faded aspect, and forms the so called *P. Cassinii*. The yellow-winged sparrow becomes equally faded and changed, and the killdeer plover shows a similar paling of the colors, which is also noticeable in birds as brightly colored as the Baltimore oriole. The color of the mountain plover is in similar harmony with the mid-summer gray tint of the plains. In respect to the Baltimore, we find here a well marked race, characterized by the middle coverts of the wing being *white* instead of bright yellow, and by having much more white on edges of the secondaries. The bill is also slenderer and relatively longer. The Leavenworth specimens I find are, in respect to color, about half way between the Fort Hays type and the common form of the Eastern States.

DIRECTIONS FOR COLLECTING MICROLEPIDOPTERA.

BY LORD WALSINGHAM.

HAVING been asked to give a few directions for collecting Microlepidoptera, I think I can best do so by describing as shortly as possible my own mode of proceeding, adding such hints as may occur to me.

I go out with a coat provided with large pockets inside and out, containing an assortment of pill boxes generally of three sizes, glass bottomed pill boxes preferred, a bag slung over my shoulder, and a net. Unless searching for particular day flying species I prefer the last three hours before dark. As the sun goes down many species move which do not stir at other times. I watch the tops of the grass, the stems of the flowers, the twigs of the trees; I disturb leaves and low growing plants with a short switch and secure each little moth that moves, taking each out of the net in a separate pill box, selected according to the size of the insect, as he runs up the net to escape. Transferring the full boxes to the bag I continue the process until moths cease flying or night sets in. Many species can be taken with a lamp after dark.

Returning to camp I put a few drops of liquid ammonia on a small piece of sponge and place it in a tin canister with such of the boxes as do not contain the smallest species, and put these and the remainder away until morning in a cool place. In the morning I prepare for work by getting out a pair of scissors, a pair of forceps, my drying box containing setting boards, a sheet of white paper and some pins.

First, I cut two or three narrow pieces of paper from three to six lines wide, or rather wider, according to the size of the largest and smallest specimens I have to set. I then double each of these strips and cut it up into braces by a number of oblique cuts. Now I turn out the contents of the canister and damp the sponge with a few drops of fresh ammonia, refilling with boxes containing live insects. Those which have been taken out will be found to be all dead and in a beautifully relaxed condition for setting. Had the smallest specimens been placed in the canister over night, there would have been some fear of their drying up, owing to the small amount of moisture in their bodies.

If the weather is very hot there is some danger of killed insects becoming stiff while others are being set, in which case it is better at once to pin into a damp cork box all that have been taken out of the canister, but under ordinary circumstances I prefer to pin them one by one as I set them.

Taking the lid off a box, and taking the box between the finger and thumb of the right hand, I roll out the insect on the top of the left thumb, supporting it with the top of the fore finger and so manipulating it as to bring the head pointing towards my right

hand and the thorax uppermost. Now I take a pin in the right hand and resting the first joint of the middle finger of the right against the projecting point of the middle finger of the left hand to avoid unsteadiness, I pin the insect obliquely through the thickest part of the thorax so that the head of the pin leans very slightly forward over the head of the insect. After pressing the pin far enough through to bring about one-fourth of an inch out below, I pin the insect into the middle of the groove of a setting board so that the edge of the groove will just support the undersides of the wings close up to the body when they are raised upon it. The board should be chosen of such a size as will permit of the extension of the wings nearly to its outer edge. The position of the pin should still be slanting a little forward. The wings should now be raised into the position in which they are intended to rest, with especial care in doing so not to remove any scales from the surface or cilia of the wings. Each wing should be fastened with a brace long enough to extend across both, the braces being pinned at the thick end, so that the head of the pin slopes away from the point of the brace; this causes the braces to press more firmly down on the wing when fixed. The insect should be braced thus: the two braces next the body should have the points upwards, the two outer ones pointing downwards and slightly inwards towards the body, and covering the main portion of the wings beyond the middle. Antennæ should be carefully laid back above the wings, and braces should lie flat, exercising an even pressure at all points of their surface. The fore wings should slope slightly forwards so that a line drawn from the point of one to the point of the other will just miss the head and palpi. The hind wings should be close up, leaving no intervening space but just showing the upper angle of the wing evenly on each side. I can give no more precise directions as to how this desirable result may most simply and speedily be attained; no two people set alike. Speed is an object: for I have often had to set twelve dozen insects before breakfast. A simple process is essential, for a man who is always pinning and moving pins, and rearranging wings and legs, is sure to remove a certain number of scales and spoil the appearance of the insect besides utterly destroying its value. I raise each of the fore wings with a pin and fix the pin against the inner margin so as to keep them in position while I apply the braces. Half the battle is really in the pinning. When an insect is

pinned through the exact centre of the thorax, with the pin properly sloped forward, the body appears to fall naturally into its position on the setting board, and the muscles of the wings being left free are easily directed and secured; but if the pin is not put exactly in the middle, it interferes with the play of the wings. Legs must be placed close against the body or they will project and interfere with the set of the wings. Practice, care and a steady hand will succeed. When all the insects that have been killed are set, the contents of the canister will be found again ready, twenty minutes being amply sufficient to expose to the fumes of ammonia. Very bright green, or pale pink insects should be killed by some other process, say chloroform, as ammonia will affect their colors.

Insects should be left on the setting boards a full week to dry, then the braces may be carefully removed and they may be transferred to the store box.

Having given some account of the process each insect goes through I will say a word as to the apparatus required.

First as to nets. The simplest net is a strong, circular, iron wire hoop with bag of book muslin attached, fastened into a light deal or other handle.

I use a small pocket net about 9 inches in diameter made to fold up, with a jointed wire frame and a screw to fit into a brass socket in a short cane handle. To counteract the strain of the net upon so slight a frame the three wire joints are made flat, the two side joints flattened across the strain, the upper one the reverse way; but to prevent this upper joint from coming into play when the net is fixed, the upper part of the screw which holds the frame to the handle is welded square and fits a corresponding square socket in the other end of the wire frame, holding all tight when screwed down. A small green silk or other net can be slipped on or off this frame as required.

An umbrella net with stout steel rim and canvas edging is useful for sweeping tall grass and herbage, or to beat branches into, by which means many small and beautiful species of retired habits may be obtained.

I use pill boxes with glass bottoms, which can be obtained of various sizes. They are convenient in admitting of the examination of each specimen, so rare species can be especially searched for, and damaged ones permitted to escape; but they are expensive and for

ordinary purposes cardboard boxes answer sufficiently well. It is a good plan at the beginning of a season to strengthen all your boxes by a crossed strap of tape or calico firmly glued at the top and bottom. For a killing box any tin box or canister with a closely fitting lid capable of containing one hundred pill boxes will be found to answer.

Setting boards can be bought ready made of the smallest sizes. They are made by gluing a strip of thick cork on a thin slip of deal, the cork must be thick enough to enable a groove to be cut into it, deep enough to hold the bodies of the insects to be set and to leave sufficient depth for the pin to hold firmly without reaching the deal. The cork on each side of the groove should be smoothed off with a gentle curve, so that the wings dry in a good position. The deal backing projects beyond the cork so as to slide into a groove if required, and it is convenient to have a deal cupboard of drying boxes with handle at top and perforated zinc door, having grooves on each side into which the setting boards can be slid. Each board should be papered with thin white paper.

At the beginning of a season setting boards may be washed or brushed over with advantage with a weak solution of oxide of zinc, it fills up old pinholes and makes them look clean.

For *Tortricina* use No. 10 pins; for *Tineina* (small), No. 19; for *Nepticulæ*, No. 20.

Always set your insects as soon as you kill them, they are then much more easy to set and retain their position better when dry.

When pill boxes are filled keep them cool to prevent the insects from fluttering; if glass boxes, keep them also in the dark.

Many species when first taken will flutter in the boxes and injure themselves; for these it is well when collecting to carry a small phial of chloroform and a zinc collecting box corklined, into which you can at once pin your captures; the cork should be damped to keep them fresh. Touching a pill box with a finger moistened with chloroform will kill the insect inside. Too much chloroform is apt to stiffen the nerves of the wings and interfere with setting.

By breeding Microlepidoptera many species not otherwise easily obtainable may be added to a collection, and the habits of others in the larva state may be studied with much interest. For this purpose a few wide mouthed glass bottles should be obtained with corks to fit, so that the small larvæ can be placed in them with fresh food and the food kept fresh by exclusion of air. If

mould should appear the cork can be replaced by muslin or net tied over. I would hardly advise a travelling collector to attempt this method although I have adopted it with some success, but in a stationary camp it is most interesting and comparatively easy.

Corklined store boxes are of course required into which to remove the insects when sufficiently dried on the setting boards. These, as well as the pins and setting boards with drying case to hold them, and the net frames of the folding and umbrella patterns will best be obtained from some dealer in such things.*

To pack Microlepidoptera for travelling, pin them firmly close together into a corklined box, so that each specimen just gently holds down the body of the one above it. This cannot be done with very minute species. Put your box into another larger box and let the outer one be sufficiently large to leave a good clear six inches all round the inner one. Pack this intervening space with hay not crammed too tight; it will act as a spring and reduce the effect of shaking; the whole parcel should be made thoroughly secure against damp.

In conclusion I would say that I shall be happy to receive specimens from collectors in all parts of the world and will willingly send European species in exchange where this is desired; or if preferred I will pay at the rate of, say four cents each, for all specimens sent in good condition. I shall also be happy to answer all communications upon the subject and to send a small box containing two or three specimens as types to show how insects ought to be set, to any one who proposes to send me specimens. Moreover should any collector send me insects in good condition I will willingly supply him with a full outfit of setting boards and pins and a store box to encourage further collections.†

Insects in a damaged condition are not of the slightest value to me in any way.

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*In London there are several, among whom I would mention T. Cook, New Oxford Street, and Thomas Eedle, Maidstone Place, Hackney Row. The manufacturers of entomological pins, which can, however, be obtained from the above dealers, are Messrs. Eddleston & Williams, Birmingham; Messrs. Kirby & Beard, Canon Street, London. In America, The Naturalists' Agency, Salem, Mass., and C. G. Brewster & Co., Washington St., Boston, keep on hand insect pins, cork, pill boxes, and most of the other articles required by the collector.

†Address, The Lord Walsingham, Merton Hall, Thetford, England.

INSTRUCTIONS FOR PREPARING BIRDS' EGGS.

BY WILLIAM WOOD, M.D.

I WISH to say a few words for the benefit of those engaged in collecting oölogical specimens.

Twenty years ago, all eggs were blown with two holes—one at each end, and until within ten years most eggs have been emptied with two holes as above, or at the side. Very many of the eggs which I now receive in my exchanges are similarly prepared. At the present time no experienced collector ever makes but one hole to remove the contents of the egg, using a blowpipe in some form to accomplish this object. The following rules should invariably be followed.

1st. Prepare your eggs neat and clean. There is no excuse for having a dirty set of eggs where water, soap, and a tooth brush can be found. Some eggs will not bear washing, as the shell is so calcareous that the characteristic markings will wash away. There are, however, but few of this class, and I believe this peculiarity is confined to the water-birds. You can see it in any of the species (Smithsonian Catalogue) from 615 to 628 inclusive, and also in the eggs of the Grebes and Flamingo, and some others. Having once seen it you will never mistake it for anything else.

2d. Make but one hole, and that a small one in the middle of the egg—cover this hole, when the contents are removed and the specimen is dry, with gold-beater skin or the paper number indicating the bird. Use an egg drill or a pointed wire of four or six sides to make the opening.

3d. If the blowpipe does not readily remove the contents of the egg, inject water and shake the specimen thoroughly, then blow again, and repeat the operation until every particle of the egg is removed.

4th. If the embryo is too far advanced to remove through a moderate sized hole, blow out what you can of the liquid part and fill the egg with water, wipe it dry and put it away in a covered box in some warm place, and every 24 or 48 hours shake it well and remove what you can, and then refill with water. Repeat this

operation several times, and after a few days the contents will become sufficiently decomposed to take away.

5th. After removing the contents of any egg cleanse the shell thoroughly. Fill it with clean water and shake vigorously, blow out the contents and repeat the operation until the specimen is perfectly clean. This is particularly desirable in white eggs, as black spots will show through the shell after a time if the least particle of the egg or blood stains remains inside.

6th. Save all your eggs in sets—that is, keep all the eggs each bird lays by themselves. This is the only way to form a correct knowledge of the eggs of any species, as a single egg, particularly of the blotched ones, frequently gives a very erroneous idea of the general markings—a very unsatisfactory representative of a set. For instance, in my collection are four eggs of the *Buteo lineatus*, found in the same nest, two of which are pure white and two blotched. It is not very uncommon to find great variations in markings in the same species and in the same nest.

7th. Keep a memorandum of the place and date of collecting each set of eggs.

8th. Use some kind of a blowpipe in preparing your eggs for the cabinet. The common blowpipe, with the addition of a fine pointed tip, will answer; yet it is a severe tax on the lungs and brain if you have many eggs to blow. I have many a time been dizzy and almost blind from overtaxing my lungs in this operation. Within a few years Mr. E. W. Ellsworth, of East Windsor Hill, Conn., has invented a blowpipe which is operated by the thumb and finger, which works very perfectly and expeditiously. I would not be without it on any account. After using it for a time, and then letting it remain unused until the leather packing becomes dry, the instrument does not work satisfactorily to those unaccustomed to it. The remedy is simple. Take off the blowpipe and work the instrument submerged in a bowl of warm soap suds, when the leather packing becomes pliable and works as well as new. I have used the same instrument six years, and it works to-day as well as when new by following the above directions. The printed directions which accompany each instrument are intended to be a sufficient guide in case repairs are needed, and the maker can be referred to for any further information required.

RELATIONSHIP OF THE AMERICAN WHITE-FRONTED OWL.

BY ROBERT RIDGWAY.

I WISH to call the attention of ornithologists to a paper recently published in the London "Ibis" (vol. ii, January, 1872), upon the relationship of the North American White-fronted Owl, known as "*Nyctale albifrons* Shaw," or "*N. Kirtlandii* Hoy." The author of the paper in question, Mr. D. G. Elliot, refers that bird to the *N. Tengmalmi* Gmel., of Europe, with which species he also considers our *N. Richardsoni* Bonap., to be identical. That both these opinions are erroneous, I purpose showing in the following remarks:

The little owl above mentioned, is a bird identical in all the details of form and size with the *N. Acadica* Gmel., an exclusively North American form, which is scarcely more than half the size of the *N. Tengmalmi*, and cannot, by any means, be referred to the latter species. The birds which Mr. Elliot supposes to be identical with "*N. albifrons*" are merely the young of *N. Tengmalmi*, in a plumage analogous to that of the small North American species, but resembling the latter no further. Mr. Elliot is by no means the first to notice this plumage, for it has been long known to European ornithologists, and its relations correctly understood (see Naumann "Die Vögel Deutschlands," i, p. 500, pl. 48, figs. 2 and 3—where both the adult and young plumages are illustrated). Neither do I claim to be the first to refer the "*N. albifrons*" to the *N. Acadica*, as being its young stage, for Strickland in "Ornithological Synonymes" (i, 1855, p. 177) places the two together.

Being aware of the differences between the adult and young plumages of the *N. Tengmalmi*, and seeing a direct analogy in the characters of the *N. Acadica* and "*N. albifrons*" I suspected a similar relation between these two small North American forms; and in the course of my investigations of the North American Strigidæ in the collection of the Smithsonian Institution I found other reasons for considering them old and young of one species. These reasons I present as follows:—

1st. All specimens examined, of *N. albifrons* (including Hoy's

type of *N. Kirtlandii*) *are young birds*, as is unmistakably apparent from the texture of the plumage.

2nd. All specimens examined of the *N. Acadica*, are *adults;* I have seen no description of the young.

3rd. The geographical distribution, the size and proportions, the pattern of coloration (except that of the head and body, which in all owls is more or less different in the young and adult stages) and the shades of color on the general upper plumage, are the same in both. The white "scalloping" on the outer web of the alula, the number of white spots on the primaries and the precise number and position of the white bars on the tail, are features common to the two.

4th. The most extreme example of "*albifrons*" has the facial circle uniform brown, like the neck, has no spots on the forehead, and the face is entirely uniform dark brown; but—

5th. Three out of the four specimens in the collection have the facial circle composed of white and brown streaks (*adult feathers*) precisely as in *Acadica*, and the forehead similarly streaked (*with adult feathers*). Two of these have new feathers appearing upon the sides of the breast (beneath the brown patch), as well as upon the face; *these new feathers are, in the most minute respects, like* common (adult) dress of *N. Acadica*.

The above facts point conclusively to the identity of the *Nyctale* "*albifrons*" and *N. Acadica*. This species is easily distinguishable from the *N. Tengmalmi* which belongs to both continents, though the North American and European specimens are distinguishable, and, therefore, should be recognized as geographical races.

I give below a brief synopsis of the two species, and the principal list of synonymes belonging to each:—

DIFFERENTIAL CHARACTERS OF NYCTALE.

Tengmalmi and *Acadica*.

COMMON CHARACTERS.—Tarsus longer than middle toe; tail slightly rounded, or nearly square: five outer primaries emarginated on inner webs, their ends broad and bowed; 3d quill longest. Upper parts generally chocolate-brown, more or less spotted with white, the tail having distant transverse narrow bars of the same. *Adult:* Facial circle and forehead variegated with white; eyebrows and face grayish white; lower parts white with longitudinal spots, or stripes, of chocolate brown. *Young:* Facial circle and forehead plain blackish brown; eyebrows pure unvariegated, white; face plain dusky; lower parts without markings; the breast plain chocolate brown; the abdomen, etc., plain ochraceous.

A.—Nostril sunken, opening laterally; elongate oval, and obliquely vertical. Cere not inflated. Tail more than half the wing. Bill yellow.

1. N. TENGMALMI. — Wing about 7.20; tail 4.50.

a. Legs white, scarcely variegated; lower tail coverts with only narrow shaft streaks of brown. (Maximum amount of white, the spots of this color much extended, on the scapulars even largely predominating over the brown.) *Hab.* The Palæarctic Region (Europe, Liberia and Northern Africa.) . . . . . Var. *Tengmalmi*.*

b. Legs ochraceous, thickly spotted; lower tail coverts with broad medial stripes of brown. (Minimum amount of white, and excess of darker colors; the latter not only deeper in tint, but occupying larger areas. The difference readily appreciable on comparison.) *Hab.* Northern portion of the Nearctic Region (Arctic America south to the northern border of the U. S.). . . . . Var. *Richardsoni*.†

B.— Nostril prominent, opening anteriorly; nearly circular. Cere somewhat inflated. Tail not more than half the wing (rather less). Bill black.

2. N. ACADICA.‡ — Wing 5.25 to 5.80; tail 2.60.— *Hab.* Cold temperate portions of Nearctic Region (Southern British America and Northern U. S. from the Atlantic to the Pacific on the mountain ranges, southward nearly to the southern borders of the U. S., and into Mts. of Mexico. Oaxaca, *Sel.* P. Z. S. 1858, 295).

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* NYCTALE TENGMALMI.

Strix Tengmalmi GMEL., S. N. p. 291, 1789 (et Auct. var.). — *Nyctale Tengmalmi* BONAP. et Auct. — *Noctua Tengmalmi* CUV., et Auct. — *Athene Tengmalmi* BOIE. — *Ulula Tengmalmi* BONAP. et Auct. — *Scotophilus Tengmalmi* SWAINS. — *Strix dasypus* BECHST. (1791) et Auct. — *Nyctale dasypus* GRAY. — *Strix passerina* A. MEYER (1794). — PALLAS. — *Nyctale planiceps* BREHM (1831). — *Nyctale pinctorum* BREHM (1831). — *Nyctale abietum* BREHM (1831). — *Nyctale funerea* BONAP. (1842). (Not of LINN., 1761, which is *Surnia ulula*.) — *Nyctale Kirtlandi* ELLIOT, Ibis, II, Jan., 1872, p. 48. (Not of HOY!)

† NYCTALE TENGMALMI var. RICHARDSONI.

Nyctale Richardsonii BONAP. Eur. and N. Am. B., p. 7; 1838, et Auct.

‡ NYCTALE ACADICA.

Strix Acadica GMEL. Syst. Nat. p. 296, 1789. — DAUD. N. Orn., II, 206, 1800. — VIEILL. Ois. Am. Sept., I, 49, 1807. — AUD. B. Am. pl. 199, 1831; Orn. Biog. V, 397. — RICH. and SWAINS., F. B. A., II, 97, 1831. — BONAP. Ann. Lyc. N. Y., II, pp. 38, 436; Isis, 1832, p. 1140. — JARD. (Mis.) Am. Orn. II, 66. — NAUM. Nat. Vog. Deutschl. ed. nov. I, 434, pl. 43, figs. 1 and 2. — PEAB. B. Mass., p. 99. — NUTT. Man. p. 137, 1833. — *Nyctale Acadica* BONAP. List. p. 7, 1838; Consp. Av. p. 44. — GRAY, Gen. B. fol. App. p. 3, 1844. — KAUP, Monog. Strig. Crut. Orn. 1852, p. 104. — STRICKL. Orn. Syn. I, 176, 1855. — NEWB. P. R. R. Rept. VI, 77, 1857. — CASS. B. N. Am. 1858, 58. — COOP. & SUCK. P. R. R. Rept. XII, ii, 156, 1860. — COUES Prod. B. Ariz. H, 1866. — GRAY Hand List I, 1869, 51. — LORD Pr. R. A. I, IV, iii (Brit. Columb.). — *Scotophilus Acadicus* SWAINS. Clasif. B. II, 247, 1837. — *Strix passerina* PENN. Arct. Zool. p. 236, sp. 126, 1785. — FORSH., Phil. Trans. LXII, 385. — WILS. Am. Orn. pl. 34, f. 1, 1808. *Ulula passerina* JAMES. (Wils.) Am. Orn. I, 103, 1831. — *Strix Acadiensis* LATH. Ind. Orn. p. 65, 1790. — *Strix albifrons* SHAW. Nat. Misc. V, pl. 171, 1794; Zool. VII, 238, 1809. — LATH. Orn. Supp. p. 14. — *Bubo albifrons* VIEILL. Ois. Am. Sept. I, 54, 1807. — *Scops albifrons* STEPH. Zool. XIII, ii, 51. — *Nyctale albifrons* CASS. B. Cal. & Tex. 187, 1854. — BONAP. Consp. Av. p. 54. — CASS. Birds N. Am. 1858, 57. — *Strix frontalis* LICHT. Ath. Ak. Berl. 1838, 430. — GRAY Hand List I, 52, 1869. — *Nyctale Kirtlandii* HOY, Proc. Ac. Nat. Sc. Phil. VI, 210; 1852. — *S. phalænoides* DAUD. Tr. Orn. II, 206, 1800. — LATH. Ind. Orn. Supp. p. 16, 1802; Syn. Supp. II, 66, Gen. Hist. I, 372, 1828. — *Athene phalænoides* GRAY, Gen. B. fol. sp. 43, 1844. — *Athene Wilsoni* BRIE, Isis, 1828, 315.

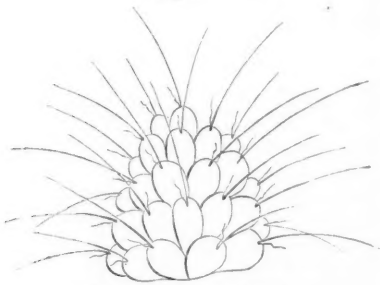
ONE OF OUR COMMON MONADS.

BY PROF. ALBERT H. TUTTLE.*

SINCE the investigations of Clark, Carter and others upon the sponges and their allies, anything which adds to our knowledge of the Flagellate Infusoria is of especial interest. I have fortunately had an opportunity of making a careful study of a genus *Urella* of Ehrenberg, about which thus far but little that is satisfactory has been known.

Until recently but little has been known of the real nature of the Monadina. As a natural consequence, organisms have been referred to the different genera of this family upon very slight study and superficial resemblances. Urella, which Ehrenberg describes thus, "aggregate monads, free-swimming, tailless, devoid of an eyespeck and having one or (doubtfully) two flagelliform filaments," has of course received its share of attention until one might think from the "species" and the figures given that the diagnosis of the genus had been "anything very minute, aggregated, free-swimming," — whether Infusorian or Alga making no difference.

Fig. 88.



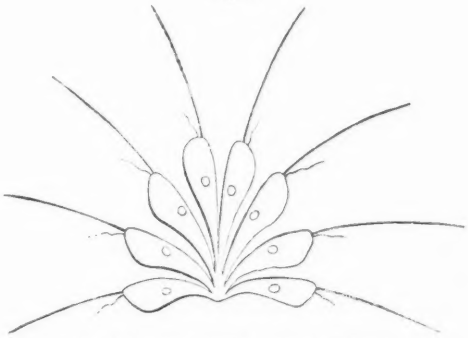
A colony of about forty Monads.

When, therefore, I found in a collection made at Spy Pond, near Cambridge, on the 25th of November last, a large number of individuals of this genus (probably the species *glauconia* Ehr.), I made use of the opportunity for a careful study of it, devoting my spare time to it daily as long as I continued to find it in the water; what follows is therefore the result of a number of observations, at which each point has been examined and verified.

* Communicated to the Section of Microscopy of the Boston Society of Natural History, Dec. 13th, 1871.

Urella probably finds its nearest ally in Anthophysa, differing from that genus principally in being free-swimming instead of fixed upon a stalk. The number of monads in a colony is quite variable, almost every number having been seen, up to forty or fifty; in this, however, as in many other respects, the constant activity of the colonies renders it impossible to speak with absolute certainty; even when cornered so that they could no longer progress in the direction in which they had been moving, they continued to revolve upon their axes with considerable rapidity, making it impossible to count them with accuracy. Occasionally, a group of five or six or even two or three and not unfrequently a

Fig. 89.



An ideal section through a colony of Monads.

single monad would be seen, and these were more available for purposes of study, though the larger groups were more frequent.

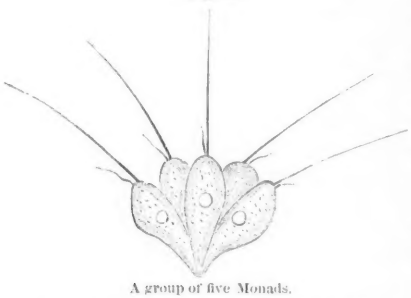
From such measurements as I was able to make while they were in motion, I should say that the average length of each monad was about one two-thousandth and the breadth one five-thousandth of an inch; but these dimensions varied a good deal with the size of the colonies, the individuals in the larger groups being more elongated and narrower than those in the smaller ones. The form may be described as conical with a rounded base not at right angles with the axis of the cone, the part at the greatest distance from the apex being the one nearest the apex of the colony; in colonies of over ten or twelve the axis of the cone being also bent towards the apex of the group, especially in those monads near the base. The form of the larger colonies varied from hemispher-

ical to raspberry or even mulberry shape, the form shown in Fig. 88 being the most common.

I was unable to find any trace of a common investing membrane in either the larger or the smaller groups, nor do I believe that any such membrane exists in any true species of Urella.

I was able to distinguish clearly *two* flagella, both arising from a point near the most elevated side of the base of the cone. The larger one was stiff, arcuate with the concave side toward the base before mentioned, somewhat longer than the body of the monad, and very plainly seen with any objective above a quarter-inch; the smaller is very delicate, short and incessantly active. I first saw it with a Wales' fifteenth, but after becoming familiar with its appearance I was always able to detect it with a Tolles' eighth or a Hartnack number nine.

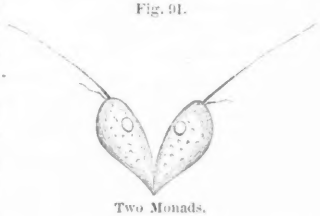
Fig. 90.



A group of five Monads.

I am not certain as to the number of contractile vesicles but it is my opinion that there is but one: sometimes a larger number of clear spaces would be seen in the body, but they were not observed to contract. I do not wish, however, to speak with any degree of positiveness upon this point, as I was not able to keep a single monad in view long enough to satisfy myself, on account of the constant revolution of the colonies. As regards the ingestion of food I have seen something, though not as much as I could wish, as this is still a disputed question. I fed them with indigo which they ate readily, and I frequently watched its ingestion. On account of their incessant motion, I was not able to satisfy myself of the existence of a definite mouth, but I did not see a single instance of the indigo being received at any point except very near the com-

Fig. 91.



Two Monads.

mon base of the flagello, and in every instance observed, the act of ingestion was preceded by a quick bending of the larger flagellum by which the particle of indigo was thrown against the surface of the body in a manner similar to that described by Professor Clark in his observations upon Monas. So far as I was able to follow the process, whenever a colony reduced its rate of motion sufficiently to permit of careful observation upon this point, it was so much like the process described in Monas as to leave little doubt in my mind that it was substantially the same: although as I have said I did not *see* a distinct mouth.

Fig. 92.

A Single Monad.

It appears probable, now that the Monadina are better understood, that we shall soon be able to recognize in them a well-defined family of the Flagellate Infusoria, although doubtless many forms that have been assigned to that group are vegetable in their nature; these will be gradually removed and those forms which are unquestionably animal will be distinguished: among these it seems to me the genus Urella as described by Ehrenberg will undoubtedly take its place.

Figure 88 represents a colony of about forty monads; Fig. 89 an ideal section through such a colony; Fig. 90 represents a group of five; Fig. 91 of two, and Fig. 92 a single monad. I have attempted to sketch in this last the position of the large flagellum when throwing a particle of food against the mouth region.

All the above figures are enlarged one thousand diameters.

REVIEWS AND BOOK NOTICES.

Geological Survey of Ohio.*—Though this is but a yearly report of progress, yet it is an important contribution to American geology, both in its purely scientific and practical aspects. We are convinced that when the final reports shall be published, the citizens of the State of Ohio will feel proud of the thorough and able manner in which the survey has been carried on and com-

*Report of Progress in 1870. By J. S. Newberry, Chief Geologist. Including Reports by E. B. Andrews, Edward Orton, J. H. Klippart, Assistant Geologists; T. G. Wormley, Chemist; G. K. Gilbert, M. C. Read, W. B. Potter and Henry Newton, Local Assistants. 8vo, pp. 568, with maps and engravings.

pleted, and of the monument to scientific zeal and learning erected in the series of magnificent works which we are promised in the present report. We make a few extracts regarding the discoveries made by the survey. The fossil invertebrates are to be worked up by Profs. Hall and Worthen, many novelties having been found.

"The interesting collection of Amphibian remains, which includes more than a dozen species, obtained by myself some years ago from the coal rocks of Ohio, has been placed in the hands of Prof. E. D. Cope, of Philadelphia. He has described them and caused them to be carefully drawn. They supply material for six or more plates, which will add much to the interest of our final report.

The fossil fishes and fossil plants found in the State have been described by myself. They have been drawn by Mr. T. Y. Gardner and Mr. G. K. Gilbert in a style that has not been surpassed in this country, and some of their work is equal to any of a similar character done by the best European draughtsmen. The illustrations already prepared of this material form over forty plates; and I do not hesitate to say that the objects which they represent are not exceeded in scientific interest by any that have been described by palæontologists. The fossil fishes comprise many genera and species, some of which are more remarkable for their size, their formidable armament or peculiarities of structure than any of those which formed the themes of Hugh Miller's glowing descriptions. These have, for the most part, been found only in Ohio; have never been described and will not fail to deeply interest all the intelligent portion of our population.

In my first report of progress (p. 5) I have shown how useful, even indispensable, fossils are to the student of geology, and I am happy to know that their significance and value are coming to be generally appreciated. There are, however, yet some intelligent men, even editors and members of the legislature, who cherish the notion that there is nothing which has any value in this world but that thing which has a dollar in it, and that so plainly visible as to be seen by them. Such men, to quote the language of one of them, 'don't care a row of pins for your clams and salamanders, but want something practical.' Happily the class to which they belong is rapidly passing away. Were it otherwise I should endeavor to prove to them that the fossils which they despise *are* eminently practical; that they are labels written by the Creator on all the fossiliferous rocks, and that no one can be a geologist who has not learned their language."

We are promised that the final reports will consist of four volumes, of which the first two will be on Geology and Palæontology with a geological map on a large scale, vol. 3 on Economic Geology and vol. 4 on Agriculture, Botany and Zoology.

In his "Sketch of the Structure of the Lower Coal Measures in Northeastern Ohio," Prof. Newberry says that:—

"It is worth noticing, in this connection, that the Killbuck and Tuscarawas run in parallel synclinal valleys, and it seems probable that the folding of the strata which formed these subordinate troughs and ridges in our great coal basin first gave direction to the draining streams of the region we have been considering; and that, in a general way, these lines of drainage have retained, through all subsequent mutations the directions thus given them.

Our knowledge of the geology of our coal field is yet too incomplete to permit me to speak with confidence; but, from the facts already observed, I am prepared to find that the bearings of the valleys of the Ohio and all its main tributaries in our State have been determined by the same causes that produced the great folds of the Alleghany mountains.

Another interesting fact in regard to the valleys of the streams is, that they are all cut far below the present stream-beds. The valley of the Beaver is excavated to a depth of over 150 feet below the present water level. The trough of the Ohio is still deeper. The Tuscarawas, at Dover, is running 175 feet above its ancient bed. The rock bottom of the Killbuck valley has not yet been reached.

The borings made for oil along the streams of the region under consideration, as well as in other parts of the country, afford many remarkable facts bearing on this subject. They will be reported more in detail in the chapter on Surface Geology in our final report."

Prof. Andrews records an interesting discovery, as follows:

"At Zaleska, in mining the Nelsonville coal, a fine bowlder of gray quartzite was found half imbedded in the coal, and the other half in the overlying shale. The quartzite is very hard, and the bowlder was rounded and worn by friction before it came into the coal. The dimensions of the bowlder are not far from 17 inches in the longer diameter, and 12 inches in the shorter. Adhering to the stone in places are portions of coal and black slate which show the smooth surface called "slickensides." These indicate movement and pressure. Doubtless the bowlder had settled into the coal while the coal was in a comparatively soft state at the time of the bitumization.

How the bowlder came there, is a question not easily answered. That it came in at the time of the deposition of the sediments which constitute the shale over the coal, is doubtless true. But currents from which comparatively fine sediments are dropped, would hardly have force enough to move heavy bowlders. The usual explanation of isolated bowlders, such, for example, as are found over our prairies, is that they were dropped from melting icebergs or other floating ice. This explanation would require us

to account for the existence of ice during the period of the productive Coal-measures. A part of the vegetation of the coal period was allied more or less closely to the modern ferns, but these, of very large size are found chiefly in the tropics. Coal is, however, found in arctic regions. This fact has been supposed to indicate a warm climate during the coal period. There are two equally important elements in all calculations respecting the origin of coal. The first is a sufficiently warm atmosphere to secure luxuriant and abundant vegetation; the second, a climate sufficiently cool to prevent such decay of the vegetable matter as would forbid any accumulation. There is little or no accumulation of vegetable matter in the hot, damp climate of the tropics, the decay counterbalancing the growth. On the other hand, the peat vegetation accumulates in wet bogs in comparatively cold climates. Whether there may have been, after the submergence of the Zaleski coal, at some point more or less remote, a shore on which ice may have been formed, which floated the bowlder in question, or it was brought down by river ice from some higher and colder part of the old continent which was skirted by the coal producing lowlands, it is impossible to say.

Sir Charles Lyell in his "Students' Elements of Geology," published in 1871, gives the following paragraph on the climate of the coal period: 'As to the climate of the coal, the ferns and the coniferæ are, perhaps, the two classes of plants which may be most relied upon as leading to safe conclusions, as the genera are nearly allied to living types. All botanists admit that the abundance of ferns implies a moist atmosphere. But the coniferæ, says Hooker, are of a more doubtful import, as they are found in hot and dry and in cold and dry climates, in hot and moist and in cold and moist regions. In New Zealand the coniferæ attain their maximum in numbers constituting 1-62 part of all the flowering plants; whereas, in a wide district around the Cape of Good Hope they do not form 1-1600 of the phenogamic flora. Besides the conifers, many species of ferns flourish in New Zealand, some of them arborescent, together with many lycopodiums, so that a forest in that country may make a nearer approach to the Carboniferous vegetation than any other now existing on the globe.'"

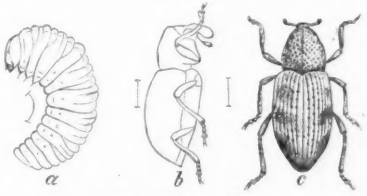
The other reports will also commend themselves to geologists, and meanwhile we trust no expense will be spared by the State in causing the final report to be published and extensively circulated.

THE NOXIOUS AND BENEFICIAL INSECTS OF MISSOURI.* — Though by the time this review appears we shall have a fourth report from Mr. Riley, a notice of some of the good things in the present re-

*Third Annual Report on the Noxious, Beneficial and other Insects of the State of Missouri, etc. By Charles V. Riley, State Entomologist. 1871. 8vo, pp. 182, with 73 cuts. Price $1.00.

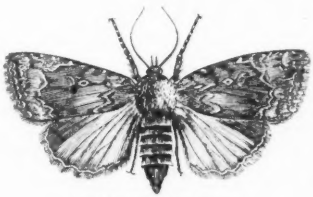
port will perhaps be "better late than never." A description of the very ingenious machines for jarring trees to rid them of the Plum Curculio will be interesting to fruit growers; while two Ichneumon parasites of this insect are described and figured. The Apple Curculio (*Anthonomus 4-gibbus*) which is doing considerable damage in Southern Illinois and some parts of Missouri is described fully and well figured, as well as the Plum Gouger (*A. prunicida*). Another weevil injures the strawberry plant. It is the *Analeis fragariæ* of Riley (Fig. 93, *a*, larva; *b* and *c*, adult beetle). The egg is probably laid in the crown; the young larva boring downwards into the pith and root, when it attains its full size, and in the autumn the plants break off. The Pea and Bean weevils are noticed at length.

Fig. 93.



Strawberry Crown-borer.

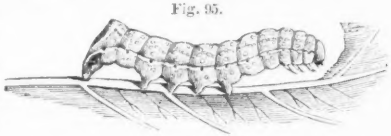
Fig. 94.



Amphipyra of the Grape.

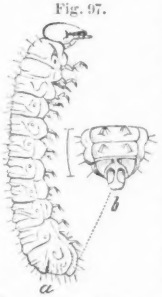
Among the insects injuring the grape are noticed several moths; among them the Pyramidal Grapevine Worm (*Amphipyra pyramidoides*, Fig. 94; 95, larva), which has not before been known to feed on the vine. It will not probably prove very troublesome. The habits of the Spotted Pelidnota and Grapevine Flea Beetle are described and figured in an excellent manner. We are also made acquainted with the habits of a rather formidable beetle, clay yellow in color, the *Colaspis flavida* (Fig. 96; 97, larva) of which the early stages are for the first time described.

Fig. 95.



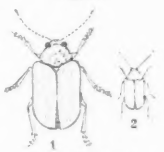
Larva of Amphipyra.

Fig. 97.



Larva of Grape Colaspis.

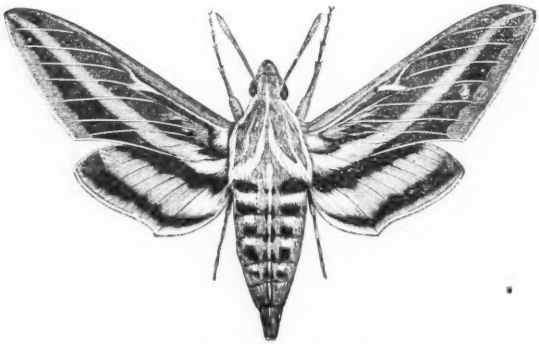
Fig. 96.



Grape Colaspis.

A valuable notice of the Grape-leaf Gall-louse (*Phylloxera vitifoliæ*) next follows, and we only hope that this fearful scourge in Europe will not abound here, though for several years it has been more or less injurious. It is thought by Mr. Riley, who has

Fig. 98.



White-lined Morning Sphinx.

studied it in France, to be the same species as the *P. vastatrix* of Europe.

The account of the Tent Caterpillars will be found to be interesting, and several other destructive caterpillars are noticed at greater or less length.

Fig. 99.

Larva of Morning Sphinx.

As a sample of the illustrations we introduce the above cuts of the White Lined Morning Sphinx (*Deilephila lineata*, Fig. 98) and its larva (Fig. 99). Riley alludes to the striking amount of larval variation in this species, having found on the same plant very light caterpillars, with black ones with a yellow dorsal line

and two rows of small yellow spots along the side. It is often attacked by Tachina flies.

The concluding chapter on "Two of our Common Butterflies (*Danais archippus* and *Limenitis disippus*); their natural history, with some general remarks on Transformation and Protective Imitation as illustrated by them," will interest all naturalists, especially those who have studied cases of mimicry.

POND LIFE.*—There is not much to be said about this exquisite little book; the best thing to do about it is to read it. As its title states, it is a new edition of a familiar work by the present able Secretary of the "Royal Microscopical Society." Its authorship would be a sufficient guarantee of its scientific accuracy, but not of its general excellence in other respects; for few men, whether eminent or not, could prepare a volume containing so much to commend and so little to regret.

With the exception of an initial chapter devoted to the apparatus employed, the book is a Natural History work, describing and commenting upon the minute living forms which abound in the ponds near London. Usually a chapter is given to the work of each month in the year; and an interesting discussion of relations closes the list. The distribution of work through the various months would be more applicable to our Southern than to our Northern states, but the chief interest of the book is entirely independent of local considerations.

Written in a lively and dashing style, though without a touch of sensationism or vulgarity, illustrated with neat and life-like wood cuts and dainty colored prints, and presented by the publishers in an attractive form, this little gem of a book would be of as much interest to a poet or a philosopher as to a naturalist. We advise every intelligent reader, whether scientific or not, to buy the volume, and read it, and having read it to join with us in wishing that the author's next edition, or next work, may be as good if not as small. — R. H. W.

DEEP SEA CORALS.† — This elaborate treatise is on the deep-sea corals collected during the recent expeditions made for the

*Marvels of Pond Life. By Henry J. Slack, F. G. S. Second edition. London: Groombridge & Sons. 1871.

† Illustrated Catalogue of the Museum of Comparative Zoölogy. No. iv. Deep Sea Corals. By L. F. de Pourtalès. Cambridge, 1871, large 8vo, with a map and 8 lithographic plates.

exploration of the Gulf Stream, by the U. S. Coast Survey. The work contains much of general geological and zoological interest from the reviews of our present knowledge of the constitution of the sea bottom on the Atlantic coast of the United States, the results of which have already been presented to our readers.

Perhaps the most interesting of the corals figured is the *Haplophyllia paradoxa* dredged off Bahia Honda, at the enormous depth (for corals) of 324 fathoms. This remarkable form is referred by Count Pourtalès to the Rugose Corals, which have hitherto only been found in strata below the Coal measures, and therefore of great geological antiquity. The nearest allied form is *Calophyllum profundum*, found fossil in the Dyas. This coral is of such interest that we copy the figures. The brief remarks on

Fig. 100.

A Deep Sea Coral (*Haplophyllia*).

the geographical and bathymetrical distribution of the corals possess much interest. The reef building species do not seem to extend to any considerable depth. "The families having apparently the greatest range in depth, are the Oculinidæ, the Stylasteridæ, and the Melleporidæ. Simple corals, which form such a large proportion of the deep sea fauna, are not represented at all in the Floridian reef fauna; some species are described from the West Indies, but without indications of depth."

The author gives a list of dead corals, which have been swept north of their original habitat by the Gulf Stream. "The indications are that a current sweeps over the bottom in a direction from south to north; in other words, the Gulf Stream extends to the bottom, at least, as far north as the highest latitude mentioned, and is not underlaid by a cold Arctic current running in an opposite direction, as has sometimes been assumed to account for the low temperature at the bottom." The work concludes with notices of the corals constituting the Florida reef. The illustrations are abundant and excellent.

BOTANY.

Professor Babington on Anacharis. — The editors of the Naturalist will do a favor by reprinting Professor Babington's short article, contributed to the April number of the "Journal of Botany," in order that the attention of our botanists may be called to it during the coming summer. It may be that we have two water-weeds, as Babington and Planchon supposed; one dioecious, the other hermaphrodite. In that case the characters of the two are commixed in my manual. That plants with "hermaphrodite flowers really do exist in the United States" is certain. Dr. Torrey's "Flora of the State of New York" describes them, and I can vouch that the description was taken from living plants. He says "the stamens are mostly three, but varying to four, five or six, or more." As to the male flowers, of the peculiar structure and economy described by Nuttall, so far as I know these have been since collected only by Dr. Engelmann at St. Louis, who gave specimens both to Dr. Torrey and myself. Dr. Torrey states that he describes these specimens. It is to be hoped that Dr. Engelmann may be able to find this sterile-flowering plant again; and that all our botanists will examine the plants they meet with and preserve specimens of any different kinds or sexes of flowers they may detect.

Professor Babington appears to have overlooked Caspary's elaborate papers on these plants. As to the name, now that Adanson's genus is *Elodes*, there is nothing to prevent the restoration of *Elodea*.—A. Gray.

On Anachaims.—There is far from being a concurrence of opinion concerning the proper generic name of the plant called *Anacharis Alsinastrum*. In our last published Flora (Hook. Stud. Fl. p. 350) the name of *Anacharis* is used, as was done by Bab. and Planch. (Ann. Nat. Hist. ser. 2, vol. i. p. 83, and Ann. Sc. Nat. ser. 3, t. xi. p. 74); but in the next preceding British Flora (Benth. Handb. ed. 1, 499; ed. 2, 447) the generic name *Elodea* is adopted. Syme (Eng. Bot. ix. 80) follows Bentham, but in a note expresses the opinion that *Hydrilla* is the proper name. Asa Gray named the North American plant *Udora* in the first edition of his 'Botany of the Northern States' (p. 462), but in ed. 5 (p. 495) he has adopted *Anacharis* as the proper name.

Richard defined genera with each of the names *Elodea*, *Anacha-*

ris, and *Hydrilla* in 1812 (Mem. Inst. 1811, pt. 2, p. 1), and had previously described the genus *Elodea* in 1803 (Mich. Fl. Bor. Amer. i. 20). In the latter work he refers *E. guyanensis* to that genus, as well as E. *canadensis*, and places them as hermaphrodite plants in the Linnæan Class and Order *Triandria Monogynia*. In both of these places he states expressly that *Elodea* has hermaphrodite flowers. In the Mem. Inst. he says that *Anacharis* and *Hydrilla* are diœcious: indeed, he did not know the female flowers of *Anacharis*. Humboldt and Bonpland (Pl. Eqinoct. ii. 150) place their E. *granatensis* in the same Class and Order, and state that it has the same structure as E. *guyanensis* Rich. But Richard describes his E. *canadensis* as hermaphrodite, in which he is wrong, if his plant is that now so named from the United States and Canada; and his *E. guyanensis* and the *E. granatensis* of Humboldt as also hermaphrodite, and in that he is correct. It is remarkable that Richard, although referring to *E guyanensis* in Michaux's work in 1803 (but by name only), does not seem to have published any description of it until the appearance of his paper (Mem. Inst.), which was issued in 1814, but communicated to the Institute in 1812. Pursh called the Canadian plant *Serpicula occidentalis* in 1814 (El. Amer. Septen. i. 33), and expressly states that the flowers are hermaphrodite. Nuttall called the same plant *Udora* (Gen. ii. 242) in 1818. He describes the *U. canadensis* as so decidedly unisexual, that the male flower is "migratory, breaking off connection usually with the parent plant; it instantly expands to the light, the anthers also burst with elasticity, and the granular pollen vaguely floats upon the surface of the water." Asa Gray gives a similar account of the male flowers of his *Anacharis*. He says, "The staminate flowers (which are rarely seen) commonly break off, as in *Vallisneria*, and float on the surface, where they expand and shed their pollen around the stigmas of the fertile flowers."

It appears from this that there are two series of plants closely resembling each other in appearance, of which one series has perfect triandrous flowers, and the other has incomplete diœcious flowers, of which the males are nearly or quite sessile, and have the curious habit of becoming detached when the pollen is ripe, and floating freely about on the surface of the water, and shedding their pollen there. Such a difference of structure and mode of fertilization has seemed to many, if not most, botanists as quite sufficient to place the plants in different genera, for here the male are of quite a distinct structure from the female flowers, and the difficulty attending the propagation of the plant is met by the power which each node of the stem possesses of producing a new plant if detached from the rest.

But even if it be considered that the diœcious structure of *Anacharis* and *Hydrilla* is not sufficient to separate them from the hermaphrodite *Elodea* of South America (*Apalanthe*, Planch.), still

the expediency of retaining *Elodea* as the genuine name is very doubtful, as the sec. *Elodea* of *Hypericum* hasbeen separated as a genus by the name of *Elodea* by Pursh, Spach, Endlicher, and others, and as there was manifestly a mistake in Richard's original definition of his *Elodea* as applied to the species of *Anacharis* (if they were intended to be included in it), although that definition does suit the South American species described by him and by Humboldt. It appears, therefore, to me that we had better retain *Anacharis* as the name of the plant well known in North America, and, unfortunately, now too well known in England.

Doubtless Richard was led to suppose that the Canadian plant is hermaphrodite from its very close resemblance to his *E. guyanensis*, which he had seen alive and then ascertained its hermaphrodite structure. The barren filaments found in the female flowers of the Canadian plant would lead him to that conclusion in the absence of the proper male flowers. I have not seen the male flowers of my *Anacharis Alsinastrum* (of which apparently only the female plant is in Europe), and A. Gray does not tell us if they are sessile, as those of *Hydrilla* are represented on Richard's plate, or shortly stalked, as in his figure of *Anacharis*, and no other author has, to my knowledge, given a plate of the male plants of either *Hydrilla* or *Anacharis*.

Hydrilla seems quite distinct by the subglobose spathe of its sessile male flowers; the spathe of the male flowers of *Anacharis* being figured and described by Richard as tubular and bifid, and described by A. Gray as sessile, tubular, and 2-cleft. Richard also says that the male flowers of *Anacharis* are stalked and so figures them, but A. Gray does not say anything on that point.

Mr. Syme gives as his opinion that "there are no characters of sufficient importance to separate the genera *Hydrilla*, *Elodea*, and *Anacharis*," but in that opinion I cannot concur. Dr. Hooker states that the staminodes of the female flowers of *Anacharis* are sometimes antheriferous. I have examined very many flowers in the hope of finding anthers, but without success, and others have been equally unsuccessful. Hooker is apparently copying Syme, who derived (?) the statement from A. Gray, in whose book it seems to result from his considering *Elodea canadensis*, Michx., as certainly the same plant, and if the same plant as certainly correctly referred to the same genus as *E. guyanensis*, *i. e.* of hermaphrodite structure. It is much to be desired that American botanists should carefully investigate and determine if hermaphrodite flowers ever really do exist in the United States or Canada, for, apparently, it is of no use hunting for them in England, where all the plants seem to have sprung from the division of a single sprig originally introduced. Probably the plant found in Scotland, which is also female, originated in the same manner.

ANOTHER DOUBLE WILD FLOWER. In July of last year (1871)

while collecting in the region of perpetual snow on James' Peak, I found and preserved a flower of *Trollius laxus* in which the stamens and most of the pistils were transformed into petals. These petals were of the same color as the sepals, but shorter, though broad, and in other respects finely developed. The plant is abundant in the high mountains of this latitude.—Rev. E. L. GREENE, *Greeley, Colorado Territory.*

ZOOLOGY.

THE LAST OF "BONASA JOBSII."—The immediate witnesses of the sudden appearance and prompt destruction of the above mentioned bird, greatly regret that a page of the NATURALIST should be occupied in recording its career; but since this is the case (see issue of March, p. 172) and since some of the statements of your correspondent require correction, we hope that a final shot may be permitted; and first since neither the NATURALIST nor its correspondent appears to have seen the following communication in which the describer of "Bonasa Jobsii" cheerfully resigned his first-born and since it contains some instructive remarks from high ornithological authorities, we request its insertion here.

"I beg the privilege of reading the views of two distinguished ornithologists, Professor S. F. Baird and Dr. Elliott Coues, upon the article published in THE ERA of December 8th, entitled "Bonasa Jobsii."

Professor Baird writes: 'Your letter of the 11th inst. with the accompanying description of the supposed new species of grouse has just been received, and after a careful examination of the account I have no hesitation in pronouncing your bird to be one of the numerous variations assumed by the common ruffed grouse. A difference in shape, or color of the plumage, or a discrepancy in an observed measure, or an anatomical peculiarity from a description based upon a dried specimen, is of comparatively little moment. The number of tail-feathers as a criterion is equally illusive, when the normal average of twelve is exceeded. When I published my work on the Birds of North America I was in what might be called the analytical stage of natural history development. My present condition is synthetical. I take more pains now to subordinate forms, once considered specific, than I do to establish them as such. I admit now but one species of *Bonasa* in the United States, with, however, an Eastern race, a Middle and a Western, these diversified by differences of plumage and slight variations of proportions which, however, are of no great

importance. A great difference in the colors of the Eastern bird has been frequently met with, and we have several specimens in our collection, answering very well to the account given of your bird.'

Dr. Coues, writing to the editors of THE ERA, says: 'The interest I take in ornithology is my excuse for begging enough of your valuable space to correct an unfortunate error that appears in your issue of December 8th. I say unfortunate, because the article in which a supposed new species of bird, *Bonasa Jobsii* is characterized, merely adds to the synonymy with which ornithology is overburdened. So far from conflicting with the genus *Bonasa*, or forming a new genus, the ruffed grouse that Mr. Jobs was unlucky enough to shoot, and Mr. Jaycox still more to write about, shows nothing of specific consequence. The number of rectrices of *Bonasa umbellus* varies from sixteen to twenty. (Vid., e. g., Bull. Mus. Comp. Zoöl., ii, 205.) The relative proportions of the tarso-metatarsus and medius-dactyl sometimes differ more than they appear to in this instance, while the discrepancies in color that are adduced by the writer are strictly within the range of individual variation.'

Thus we see Professor Baird and Dr. Coues agree that the bird described was a ruffed grouse.

There was one very important sentence omitted in the published article in THE ERA. It is: 'As I have no specimen of ruffed grouse I shall have to note the differences between the descriptions of such authors as I can consult and the bird in question.' The authorities I had the opportunity of studying were Baird's 'Birds of North America,' Wilson's 'American Ornithology,' Samuel's 'Birds of New England' and 'Observations of Wilson's American Ornithology;' in none of the above works could I find such a description of the ruffed grouse as would answer to the grouse in question. I could not find any remark which would lead one to think that the rectrices of the genus *Bonasa* were ever more or less than eighteen, and in reading Baird's 'Birds of North America' I found so many different species of birds differing from each other in so slight a degree that it led me to suppose the bird was one that had not been described.

In Professor Baird's letter he says: 'I admit now but one species of *Bonasa* in the United States.' At the time of the the publication of his work he describes two — *Bonasa umbellus* and *Bonasa Sabinii;* these he now believes to be the same bird, the difference being caused by geographical variation. Thus, by having a more complete knowledge of the different genera, he has changed his opinion in regard to the genus *Bonasa*. I do not doubt that, had Baird possessed the specimen I described, at the time he was writing 'Birds of North America,' he would have formed another genus for it; at least it would seem so from the manner in which he has made new species of specimens which

differ from each other in so few characteristics."—*From report of Proc. C. U. Nat. Hist. Soc., Jan.* 13, 1872. *Cornell Era, Jan.* 19.

Your correspondent does not allow for the immense change that has been wrought in science within the last ten years, and forgets that while a young student may be well versed in the standard works of twenty years ago, in which many species rest upon less basis than "Bonasa Jobsii;" he would not, unless directed, be apt to see the recent periodical publications in which as yet appear the only evidences of the great and beneficial revolution from the "analytical" to the "synthetical" stage of science; and so the charge of "knowing nothing of ornithology" seems to us not only harsh but unwarranted. However, as Mr. Jaycox has so readily and cheerfully acknowledged his ornithological blunder, "Bonasa Jobsii" may be regarded as the name of an extinct species, and as laying no claim to synonymy with Bonasa umbellus, and we have only to comment upon some parts of the note which occasioned this communication.

The "Cornell Era" is *not* a "publication of an institution of learning" in any sense which entitles its contents to more consideration than other "newspaper science;" it is published under the sole direction of five students and it differs from other college periodicals mainly in its willingness to publish the proceedings of the various scientific societies. So neither the Era nor the University are in any way responsible for "Bonasa Jobsii" but the Natural History Society, from the proceedings of which the description was an extract, and by the President of which (and not by the President of the University as inferred by your correspondent) the specific name was suggested; and since some of your readers may know that the Professors of the University are honorary members of the Society, and often attend its meetings, it is but fair to them to state that none were present when "Bonasa Jobsii" was introduced; had they been, Mr. Jaycox would have been at once referred to the able papers of Mr. Allen (Bull. Mus. Comp. Zoöl. vol. i, No. 8, and vol. ii, No. 3) in which the whole subject of specific characters is discussed.

In conclusion I must allude to the contrast between the manner of your correspondent's criticism and those of Prof. Baird and Dr. Coues, who may fairly be regarded as exponents of the older and younger American ornithologists. Their notes are critical without being sarcastic; and they evince respect for the honest

though misdirected zeal of a young naturalist, instead of commiseration for an "ornithological blunder," and they include nothing that might not properly be said in the presence of the person criticised, and, now as "Bonasa Jobsii" is a thing of the past let us hope to hear no more of it, and that any reply to the foregoing will be confined to the question of scientific ethics and the limits of kindly criticism.—BURT S. WILDER, *Cornell University.*

ORNITHOLOGICAL BLUNDERS.—In the March number of the NATURALIST occur some remarks respecting "An Ornithological Blunder." Such a gross mistake as that made in the case of "*Bonasa Jobsii*" certainly demanded vigorous criticism; yet are there not palliating circumstances attending this "blunder" that render the language of your correspondent's critique unnecessarily harsh? To me it seems that there are. Unquestionably bad as was the work your correspondent was called to pass upon the indiscretion here alluded to was evidently encouraged, if not indeed actually induced, by equally unfortunate "blunders" previously made, not by mere tyros, but by recognized ornithological authorities. That this was the case seems evident from the comparisons and precedents cited in the remarks accompanying the description of *Bonasa Jobsii*. Is not, in fact, *Bonasa Jobsii* one of the legitimate fruits of the excessively analytic system followed in the only general works on North American ornithology accessible to students? The authors of these valuable works may have modified their opinions, and even their methods of working since the publication of those works, but as yet the general student has no means of knowing it. It seems to me that as long as species no more worthy of recognition than *Bonasa Jobsii* have the appearance of being currently accepted, because not yet publicly retracted, mistakes like that made by Mr. Jaycox need not be looked upon as wholly unpardonable. In fact if the author of *B. Jobsii* could have truthfully added, *Hab.* "Columbia River," or, "Hudson's Bay Territory," to his description, his pseudo-species might even now have been less summarily dealt with though none the less untenable. By these remarks, however, I do not by any means wish to encourage such kind of work, but merely desire to call attention to the fact that in Mr. Jaycox's case there are extenuating circumstances.—†††.

[We gladly make room for the above, from Prof. Wilder and

another esteemed contributor, with the remark that "our correspondent" who ranks with the best ornithologists of the day, performed his duty with the utmost good will towards the author of the new name, and was simply severe on the principle, and not on the author, as a warning to all young naturalists not to run headlong into print. — EDITORS.]

VIBRATIONS OF THE TAIL IN SNAKES. — Professor Shaler has a note on this subject in the Am. Naturalist, Jan. 1872, p. 35. In 1849 Professor S. F. Baird placed in my hands for translation, the invertebrate zoology of Heck's Iconographic Encyc., but finding it a poor compilation, I rewrote it, merely following the plates of the German edition. I incorporated various original observations of my own and the following passage occurs on p. 6-7 of *zoology*.

"Instinctive actions are not taught, although a permanent habit may become an instinct. The young duck swims at once, the young snapping turtle bites when taken from the egg, and a harmless serpent without fang or rattle will vibrate its tail like a rattlesnake producing a similar sound among dry leaves. The brain of the young is modelled upon that of the adult, and where the scale of ideas is limited, they must be as essentially hereditary as the external form. (In a note—These views are favorable to the doctrine of innate ideas, which is generally opposed by speculative reasoners.) The brain of the young is not necessarily that of the adult, but that of the adult at an earlier stage. So a quality or habit is not always transmissible from a parent to its immediate offspring, but it may appear in a more distant descendant, by a kind of alternation of generations."

Professor Cope (Proc. Am. Phil. Soc. July–Dec. 1871, p. 248,) mentions several poisonous and harmless snakes which vibrate the tail when excited — a phenomenon I observed in 1841.

A point in the extract affords an illustration of the ignorance of unscientific people, and their inability even to read scientific matter correctly. I had asserted that "the young snapping turtle bites when taken from the egg," — I might have stated the fact a little stronger, for if touched, the unborn snapper turns its head and opens its mouth when the shell is broken sufficiently to expose the head. Seemingly on this statement, the "Atlantic Monthly" (May 1860, p. 516) asserts that — "Agassiz, who, knowing the savage snap of one of the full-grown *Testudinata*, is said to have asserted that, under the microscope [!] he has seen the juvenile turtle snapping precociously *in embryo*." — S. S. HALDEMAN, *Columbia, Pa.*

[Agassiz's original statement about the young turtle is in his Contr. Nat. Hist. U. S., i, p. 175 (1857) and is as follows: — In speaking of the "Succession of Characters" he says "The Snapping Turtle, for instance, exhibits its small crosslike sternum, its long tail, its ferocious habits, even before it leaves the egg, before it breathes through lungs, before its derm is ossified to form a bony shield, etc.; nay, it snaps with its gaping jaws at any thing brought near, though it be still surrounded by its amnios and allantois, and its yolk still exceeds in bulk its whole body." In a foot note he further adds, "Pr. M. v. New-Wied quotes as a remarkable fact, that the Chelonara serpentina bites as soon as it is hatched. I have seen it snapping in the same fierce manner as it does when full-grown, at a time it was still a pale, almost colorless embryo, wrapped up in its fœtal envelopes, with a yolk larger than itself hanging from its sternum, three months before hatching." — EDITORS.]

THE AFFINITIES OF CRINOIDS. — Metschnikoff, to whom we owe so many embryological investigations, has published preliminary notices* of the early stages of Comatula which are of the utmost importance, as they throw an entirely new light on the affinities of the Crinoids. Thoroughly familiar with the pluteus of Holothurians, Echini, Starfishes and Ophiurans, he commenced the investigations of their earlier stages with the determination of tracing the presence of the peculiar water system of the larvæ of the other orders of Echinoderms; what had been previously written by Busch, Allman and Thomson, on the early stages of Comatula, giving no date whatever bearing upon the subject.

To his surprise he found no such water system, nor could he trace anything in any way homologous to it; he also discovered that what constitutes the water-system of adult Crinoids, which has always been homologised with the water-system of other Echinoderms is developed in a totally different manner. In the free swimming Comatula larva the bag-like digestive sac is the only organ developed, it becomes the digestive cavity of the adult after the larva attaches itself to the ground. He noticed the tentacles as diverticula of the digestive sac in the interior of the larva; these subsequently force their way through to the exterior, at the time when the digestive bag has become further differentiated, and is provided with a mouth opening in the centre of the oval disk, and an anus opening not far from it on the side of the calyx. There

* Bulletin Acad. St. Petersburg, xv, p. 508, February, 1871.

is formed at this stage a large cavity which divides into two parts; the upper part, uniting the hollow tentacles at their base, forms the so-called circular canal, while below it, and connecting with it, we have a large cavity forming the perivisceral cavity, a mode of development of the circular ring and of the perivisceral cavity totally unlike that observed in Ophiurans, Starfishes, Echini and Holothurians.

Metschnikoff compares the mode of development of the upper and lower cavity to analogous processes in the embryonic growth of Alcyonella and other Bryozoa; he traces a striking similarity in the structure and position of the digestive organs and tentacles with similar organs of Bryozoa. However that may be, he has shown conclusively that the larva of Comatula has apparently nothing in common with other Echinoderm larvæ; but we must wait for his figures on this intricate subject before we can decide if the position he assigns to Crinoids is true to nature. — A. Agassiz, in *Amer. Jour. Sci.*

Birds New to Massachusetts Fauna.— I send you the following memoranda, of six species of birds, new to the fauna of this state taken within its limits by myself and friends, with the request that you will publish them in the Naturalist:—

Hudsonian Titmouse (*Parus Hudsonicus*). On October 30th, 1870, I took an adult female at Concord, in company with a few Golden-crested Kinglets (*Regulus satrapa*).

European Ruff (*Philomachus pugnax*). Had a fine specimen sent me in the flesh from Newburyport marshes, May 20th, 1871. Upon dissection it proved a female, with the ovaries so much developed that I judged it would have laid within two or three weeks. This, Prof. Baird informs me, is the sixth that has been taken in America.

Baird's Sandpiper (*Actodromus Bairdii*). A specimen taken on Long Island in Boston harbor, Aug. 27th, 1870, by Mr. H. W. Henshaw of Grantville, Massachusetts. This is I believe the first note of the occurrence of this bird on the Atlantic coast.

Havel's Tern (*Thallaseus Havelli*). A single specimen taken on Ipswich beach by Mr. C. J. Maynard, September 1870.

Marsh Tern (*Geochelidon Anglica*). One taken on Ipswich beach, September, 1871, by Mr. C. J. Maynard.

Barrow's Goldeneye (*Bucephala Islandica*). I obtained an adult

female in the flesh from Cape Cod, December 7th, 1871, which was pronounced by Prof. Baird unquestionably *B. Islandica*. Since then I have seen numbers of females and two fine adult males in the Boston markets, most of them shot within state limits.

Mr. Maynard also informs me that he took two more specimens of Baird's Sparrow (*Centronyx Bairdii*), October 14th and 15th, on the Ipswich sandhills, thereby confirming the hypothesis advanced by him in the "Naturalist's Guide," namely, that they are regular winter visitants from the North.

The Stilt Sandpiper (*Micropalma himantopus*) which I see was recorded in a recent number of the NATURALIST as new to our fauna, I consider by no means rare in its migrations. Indeed, I have seen as many as six or seven sent into Boston market at one time, from Cape Cod, and in the course of a few weeks' shooting in August, at Rye Beach, N. H. (just north of our state limits), secured no less than ten specimens.—WILLIAM BREWSTER, *Cambridge, Mass.*

ERROR IN DARWIN'S ORIGIN OF SPECIES. In the last edition of the above work, p. 149, Mr. Darwin misstates Hyatt and Cope's law of Acceleration and Retardation in the following language:

"There is another possible mode of transition, namely, through the acceleration and retardation of the period of reproduction. This view has lately been insisted on by Prof. Cope and others in the United States. It is now known that some animals are capable of reproduction at a very early age, before they have acquired their perfect characters," etc.

Prof. Cope and others have not insisted on the above proposition, which we imagine to be supported by very few facts. Their theory of acceleration and retardation states; that, while the period of reproductive maturity arrives at nearly the same age or period of the year in most individuals of a single sex and species, the portion of the developmental scale which they traverse in that time, may vary much. That an addition to the series of changes traversed by the parent, would require in another generation, a more rapid growth in respect to the series in question, which is *acceleration*. A falling short of accomplishing that completeness, would result from a slower growth, hence the *process* is termed retardation. Vast numbers of observed facts prove that this is the great *law of variation* towards which little progress has yet been made

by students who are yet chiefly occupied with the coöperative law of natural selection.

Acceleration and retardation of the period of reproduction may possibly have occurred; but the only case in which it has been recognized in connection with the above law, has been in regard to sex. In the human species at least, differences in several characters, mostly metaphysical, seen in the sexes and in certain races, may be consequences of the earlier or later appearance of maturity in this point. — Z.

Parthenogenesis among Lepidoptera.— The Dutch naturalist M. H. Weizenbergh jr. has performed a series of experiments on this interesting subject, the insect placed under observation being *Liparis dispar*, and concludes that it is possible for at least three successive generations to be produced without access of the male to the female. The following are the results of his very careful experiments: — (1) August, 1866, eggs laid by impregnated females; April, 1867, caterpillars appear, and in July perfect butterflies. (2) August, 1867, eggs laid by females of this year are without impregnation; April, 1868, caterpillars appear, and in July perfect butterflies. (3) August, 1868, eggs laid by females of this year without impregnation; April, 1869 caterpillars appear, and in July perfect butterflies. (4) August, 1869, eggs laid by the females of this year without impregnation; April, 1870, no results, the eggs all dried up. The power of reproduction appeared to decrease year by year when impregnation was prevented. Similar results have been noticed in other butterflies, in bees, and notably in aphides.— A. W. B.

Naturalization of Salmonidæ. — The American brook trout, *Salmo fontinalis*, is now thoroughly established in England, where it is the admiration of pisciculturists.

There seems to be no question about the success of the attempt to introduce the European trout, *S. fario*, into the rivers Derwent and Plenty in Tasmania, good-sized fish of that species being occasionally caught there. As to salmon (*S. salar*) and salmon trout (*S. trutta*), the evidence of success is not so conclusive. A letter from Tasmania, dated Dec. 30, 1871, and published in "Land and Water," asserts that there is no doubt that the Derwent is becoming yearly, more and more fully stocked with them, yet admits that no adult salmon have been caught. James A. Youl says that

the salmon and salmon trout have bred in the Plenty ponds, in fresh water, without ever having a chance of emigrating to the sea. Frank Buckland proposes to send out a net, wherewith to test the presence of salmon, from which we may infer that such an obvious means of ascertaining the facts has not yet been tried, although there was ocular proof of the presence of great numbers of fish supposed to belong to the two species in question. The eggs from which the Salmonidæ now in Tasmania, are descended, were sent out packed in ice. A large case of salmoneggs was shipped for New Zealand, last November, packed without ice, in glass jars with damp moss. — C. G. A.

Curious Habits of a Snake. I had for some time living in a Wardian case, a specimen of *Oxyclophis æstivus*, received from Ft. Macon, N. C., through the kindness of Dr. Yarrow. The slender form of this snake, and its beautiful green and yellow co'ors have led to the opinion that it is of arboreal or bush-loving habits. It never exhibited such in confinement, however, and instead of climbing over the ferns, etc., lived mostly underground. It had an envious habit of projecting its head and two or three inches of its body above the ground, and holding itself for hours rigidly in a single attitude. In this position it resembled very closely a sprout or shoot of some green succulent plant, and might readily be mistaken for such by small animals. — Edw. D. Cope.

More about Singing Mice. — A correspondent whose name is withheld sends me something that may interest your readers:

Dear Doctor. — You are quite correct, I think, when you say, as reported in the "Sun" of this morning, that the peculiarity of singing mice is not due to a diseased condition. After breeding nearly three hundred white mice with the hope of meeting one of these vocalists I at last succeeded in getting *one* and no more, yet, strange to say, he has never displayed his accomplishment more than three or four times, and he is seven or eight months old. The means I have found to induce him to sing are to keep him in a case deprived of all society and without exercise for several weeks. Upon being placed in a little tin cottage to which is attached a cylinder, he becomes very excited and joyous, and turns round and round twittering his curious note and testifying his pleasure in every possible manner. He is always in perfect health, and the young bred from him are the strongest and largest I have ever produced. He is also tame, very knowing, very pretty, and about as agreeable a companion as a solitary person could desire. I

infer that your mouse is of the ordinary color. I may mention, at the risk of telling you something you know already, that there is a kind of hiccoughing mouse; I also had one of these, but going one day on an exploring expedition in the wilds of a deserted rubbish room, he was lost, night overtook him and he froze to death.

This letter was occasioned by some general remarks made before the Maryland Academy of Science, *à propos* of Dr. Lockwood's recent article, which, like everything else he writes for the NATURALIST, is simply delightful. The whole subject is interesting. Who knows that mice have not *normally* the ability of so modulating the voice as to produce musical notes, though the faculty may be only occasionally exercised? Birds themselves, as a rule, sing chiefly under the special stimulus of the breeding season. True vocal music having been generally, but perhaps too hastily, supposed to be confined to birds more information is desirable. Who can contribute something? — ELLIOTT COUES.

THE MUSIC OF THE RATTLESNAKE. — I have nothing to say in reference to Prof. Shaler's theory of the use of rattles to the snake, but while botanizing over the marshes of Michigan during the past few years, I have had a chance to become familiar with the sound of the rattles of the Massasauga. It is so much like the singing of some grasshoppers that I have often mistaken the sound of the insect for that of the serpent. — W. J. BEAL, *Mich. Agr. College.*

MELANISM. — Noticing what Dr. Wood says, in the last number of the NATURALIST, about "melanism," it occurs to me to say that black woodchucks are found in this region and in Washington, N. H.; and I have had a perfectly black chipmunk from Milford. — SANBORN TENNEY, *Williamstown, Mass.*

GEOLOGY.

GLACIERS IN THE ROCKY MOUNTAINS. — In the NATURALIST for February, in an article on "The Mountains of Colorado, Dr. J. W. Foster denies the existence of any evidence indicating the former presence of glaciers in the Rocky Mountains. He says that so far as he observed none of the rock surfaces are polished and striated, and that those accumulations of sand and gravel in the nature of terminal moraines are entirely wanting.

With regard to the existence of terminal moraines I am con-

vinced that Dr. Foster is in error. Mr. Henry Gannett, who spent the summer of 1869 in South Park, and the region about Gray's Peak, informs me that a number of well defined terminal moraines may be seen west of Gray's Peak on the trail leading from Montezuma up the peak, and that on Clear Creek, which Dr. Foster says he took as his line of observation, near Fall River may be seen another terminal moraine. Mr. Gannett's testimony is confirmed by several other members of the party he accompanied.

Dr. Foster is undoubtedly right in saying that in the region he visited the rocks exhibit no traces of glacial markings. The granites and syenites that are first met with on entering the Rocky Mountains from the east are exceedingly friable and decompose with the greatest rapidity on exposure to the atmosphere, so that under these circumstances the planed and striated rock surfaces would long since have disappeared. It is only when passing westward, we approach the outlying spurs of the Snowy Range that the granites begin to be hard enough to retain any traces of glacial action.

Last summer in the collecting expedition to the Rocky Mountains sent out by the Museum of Comparative Zoölogy, Mr. Allen and myself had on one occasion opportunity of observing such traces of ice action as to leave in our minds no doubt of the former existence of glaciers in those mountains. These evidences of glaciation we saw near Montgomery, a mining town on the head waters of the South Platte in the northwestern part of Park county. The South Platte rises in the spur of mountains running west from Mt. Lincoln and flows eastward for about five miles through a broad gulch, the walls of which range in height from eight hundred to fifteen hundred feet. From an examination of the exposed surfaces of the rocks forming the sides and floor of the gulch, made by Mr. Allen and myself, I am convinced that at some former time the whole valley must have been filled with ice moving downward toward South Park. Wherever the rocks had not been disturbed by mining operations they were worn perfectly smooth and deeply furrowed with glacial striæ. I noticed several places where projecting rocks were polished and furrowed on the side facing up the gulch; and left untouched on the opposite side, showing that the ice field had moved down the gulch toward the Park. Near the lower end of the gulch I traced the glaciation to a height of eight hundred and more feet, or to the point where the

exposed rocks were covered with detritus resulting from a disintegration of the higher peaks by atmospheric agencies.— Richard Bliss, Jr., *Cambridge*.

Discovery of an Extinct Gigantic Bird of Prey in New Zealand. — Mr. F. Fuller, while directing some excavations in a marsh on the Glenmark estate, province of Canterbury, South Island, New Zealand, by permission of G. H. Moore, Esq. (whose researches have added so greatly to the evidences of the extinct birds of New Zealand), found, among remains of *Dinornis* exhumed at a depth of five or six feet from the surface, a few smaller bones, including claw-phalanges, which Mr. Fuller recognized as belonging to a large bird of prey. With two claw-phalanges were found a left femur, a vertebral rib with its anchylosed "epipleural appendage;" and, in a watercourse about two miles from Glenmark, a mutilated right humerus was subsequently discovered, and pronounced by Dr. Haast to be raptorial, and, as well as other and better preserved bones, most nearly resembling the corresponding bones of the New Zealand harrier (*Circus assimilis* Jardine). Dr. Haast, F.R.S., the accomplished state geologist of the province of Canterbury, has communicated an instructive and interesting memoir on these remains to the *Transactions of the Philosophical Institute of Canterbury*. He refers the gigantic raptorial bird of New Zealand, which was twice the size or bulk of the great wedge-tailed eagle of Australia (*Aquila audax* Gould), to the genus *Harpagornis*, Haast, giving it the specific name *Moorei*, after the liberal partner of Kermode and Co., owners of the Glenmark property. He conjectures, on good grounds, that this huge raptorial bird preyed upon the young or feeble individuals of the genus *Dinornis*, and, with them, became extinct. Dr. Haast deduces from this discovery an additional confirmation of his belief that the present aboriginals of New Zealand do not possess any traditions about the gigantic Moas, and writes, "that, if trustworthy traditions about the *Dinornis* had been handed down to us, the still more alarming existence of this gigantic bird of prey contemporaneous with the former would most certainly have also been recorded." I may remark that the individual who, in 1839, submitted to me, with other New Zealand rarities, the fragment of bone which gave the first evidence of great wingless birds in that island, stated that the natives from whom he obtained it had "a

tradition that it belonged to a bird of the eagle kind which had become extinct, and to which they gave the name of 'Movie.'" (*Proceedings of the Zoological Society of London*, Nov. 12, 1839, p. 169.) I am now, of course, disposed to attach more weight to this tradition than when it rested on a fossil proved to belong to a bird which could not fly, and which was at least as large as an ostrich. We may suppose the great raptorial species which we now know to have co-existed with the *Dinornithes* to have survived, by reason of its greater powers of escape, some time after the extinction of its principal prey; and the tradition of the great bird "of the eagle kind" may be a consequence of the knowledge of the *Harpagornis* continuing down to later generations of Maories than those who hunted down the huge herbivorous flightless birds. — RICHARD OWEN, *in the Academy*.

ANTHROPOLOGY.

ANOTHER LAKE VILLAGE. — "An interesting archæological discovery has recently been made on the shores of the Lake of Bienne. The Swiss Government has been for a long time endeavoring to drain a considerable tract of land between the two lakes of Morat and Bienne, but in order to do this effectually it has been found necessary to lower the level of the latter by cutting a canal from it to the lake of Neuchatel. At the beginning of the present year the sluices were opened, and the waters of the Lake of Bienne allowed to flow into that of Neuchatel. Up to the present time the level of the Bieler See has fallen upwards of three feet, and this fall has brought to light a number of stakes driven firmly into the bed of the lake. This fact becoming known, a number of Swiss archæologists visited the spot, and it was decided to remove the soil round these stakes to see whether any remains of a Lacustrine village, which they suspected had been raised upon them, could be traced. At a distance of between five and six feet from the present bed of the lake the workmen came upon a large number of objects of various kinds, which have been collected and are at present under the custody of Dr. Gross of Locrass. Among them are pieces of cord made from hemp, vases, stags' horns, stone hatchets, and utensils used apparently for cooking. The most precious specimen is, however, a hatchet made of néphrite (the name given to a peculiarly hard kind of stone from which the La-

custrines formed their cutting instruments). This hatchet is sixteen centimetres long by seven broad, and is by far the largest yet discovered in any part of Switzerland, no other collection having any measuring more than eight centimetres in length. A quantity of the bones found at the same time have been sent to Dr. Uhlmann, of Münchenbuchsee, for examination by him, and he finds that they belong to the following animals, viz:— stag, horse, ox, wild boar, pig, goat, beaver, dog, mouse, etc., together with a number of human bones. If the level of the lake continues to sink, it is hoped that further discoveries will be made, and the scientific world here is waiting the result of the engineering operations with keen interest." — *The Standard.* — *Nature.*

MICROSCOPY.

The Microscope in the Lecture Room.— Dr. N. J. C. Müller of Heidelberg sends a notice to the "Botanische Zeitung" of his experience in the use of the microscope in his botanical lectures, that deserves the attention of those who desire the help of the microscope in illustrating scientific lectures. The objections to the plan of bringing in a number of instruments under each of which a preparation has been placed, are many and serious. The most important is perhaps the difficulty which one unaccustomed to the use of the microscope has in understanding the new and strange appearances presented, and that while looking at the prominent objects in sight, such as air bubbles and foreign bodies of marked and strong outline, he misses altogether the real object which ought to have been seen. The experiment of using the ordinary microscope as a solar microscope and presenting the image of the object on a screen where it could be seen by the whole class at once, and their attention directed to the important points, was tried last summer, and with the most marked success. He used one of Hartnack's first class instruments clamped in a horizontal position and received the image on a screen distant from five to eight metres making an image of two to three metres in diameter. An heliostat and one or two condensing lenses directed the light on the object. The microscope was so placed that the stage was somewhat this side of the focus of the collecting lens. When images were desired as free as possible from spherical aberration the ocular was removed and the image taken directly

from the objective; when on the other hand the greatest possible amplification was desired, then both objective and ocular were used. In this way by the use of Hartnack's immersion lenses the finest test objects were exhibited, and the six sided spaces of the Pleurosigma shown as four to five millimetres in diameter. For such times as sunlight is not available he recommends the Drummond light, and promises to give the results of his experience in its use.

In place of the expensive heliostat, no doubt the simple arrangement often used by lecturers on Natural Philosophy might be adopted. It consists of a mirror outside the window movable in two directions by means of screws whose heads come within the room.— T. D. B.

Angular Aperture.— Dr. Pigott revives the subject of diaphragms behind the objective, and reports some very remarkable results somewhat similar, of course, to those resulting from the use of an achromatic condenser of very small angular aperture. He does not demonstrate the advantages of using a diaphragm over the objective as compared with the other and more usual method.

Preparation and Preservation of Tissues.— Dr. J. J. Woodward commences, in "The Lens," a summary of the various methods employed for this purpose. He prefers to harden the tissue by gradual dehydration by means of alcohol, and to cut it (imbedded if small, in paraffine) either off-hand or in a common section machine. By the latter means sections less than one-two-hundredth of an inch thick are easily obtained. He covers the top of the section machine with a glass plate suitably perforated and cemented fast by means of marine glue; and advises that the alcohol used to dehydrate the specimens be saved and filtered for the preservation of large anatomical specimens.

Dr. I. N. Danforth gives, in the same Journal, his methods of preparation, the main object of which is simplification of the usual procedures. He makes the pithy assertion that success depends more upon tact than upon tools. He cuts the sections from perfectly fresh tissues, by means of a thin, single-bladed knife; invariably stains them, preferring for this purpose Beale's carmine solution; washes them in diluted and acidulated glycerine; and preserves them in slightly acidulated glycerine. He very

properly denounces the slovenly custom of carrying home fresh specimens of tissues, etc., wrapped in a rag or newspaper. The policy of cutting fresh tissues frozen, which is coming into use here and abroad, seems to have escaped his notice, as it is neither adopted nor condemned and is too important an innovation to be ignored.

Absorption of Solid Particles.—"The Lancet" reviews this interesting and timely subject. Oesterlen, nearly thirty years ago, found molecules of mercury in the blood of cats, absorbed from the stomach; and he, Eberhard, Landerer, and especially Voit, rubbed the same material into the skin of cats and dogs and found it in the liver, spleen, and other internal organs. The experiments of Herbst and Bruch seemed to demonstrate the absorption into the bloodvessels of milk-globules and starch-granules; Marfels and Moleschott fed frogs on blood-corpuscles and pigment-corpuscles of sheep, and saw these corpuscles circulating in the web of the frog's foot; while Donders and Mensonides found charcoal in the blood of rabbits with whose food it had been mixed. Thus the absorption of solid particles through uninjured membranes has become nearly certain notwithstanding the negative results obtained by Bärensprung, Recklinghausen, and a few other experimenters. M. Heinrich Auspitz has recently continued these researches by means of rice-starch the granules of which, easily used on account of their small specific weight, and easily recognized by their form and by the iodine color-test, vary from about the size of the red corpuscles of the animal used (the rabbit) to about twenty times as large. Starch injected into the veins, he detected in all the organs of the body; and starch suspended in water or still better in oil, was injected into the serous cavities and into the subcutaneous cellular tissue, and subsequently recognized in the circulation.

Multiplying Species.—In describing a new variety of Lepidodendron stem, before the Royal Microscopical Society, Mr. W. Carruthers, F.R.S., states that it would be in accordance with usage to give a specific name to the new fragment. He refrains, however, for want of sufficient data, and gives the following racy illustration of the method of those investigators who set aside the work of previous workers and recklessly give new names to fragmentary specimens. "Suppose, for instance, it were discovered that we had in this country another *Papilio* beside the Swallow-tail, and

that one entomologist got hold of a hind wing and found that it had two tails, and so full of his important discovery he figures and describes his fragment as *P. bicaudatus* Mihi; another finds a head with the antennæ attached, and these are obviously more club-shaped than the known species, and of course it is *P. clavatus* Mihi; the body falls into the hands of a third, and it is thick and short and blunt, and easily distinguished from *Machaon*, so it becomes *P. truncatus* Mihi; the fore wing turns up, and it has got blue lines and spots and it would be absurd not to give this new species a name, and it is *P. cæruleus* Mihi; but the body is investigated by an entomologist with an anatomical bias, and he makes some important observations deserving to be published; and the subject must have a name, so it becomes *P. intestinalis* Mihi; and to terminate an illustration which might be carried to any extent, the caterpillar is found in a field of carrots; a discovery so important must be published at once, and it is *P. carrotæ* Mihi. The absurdity of such proceedings is apparent from such an illustration as this, but in fossil botany the terrible reality has to be encountered, and not only roots, stems, branches, leaves and fruit get different names, but different states of the same stem receive different generic and specific names."

Development of Vegetable and Animal Life.—Dr. T. C. Hilgard sums up his peculiar views on this subject in a recent lecture before the New Orleans Academy of Sciences. He recognizes no such classes as Protophyta and Protozoa; but states that "all the so-called infusoria, all the *protozoa*, *protophyta* and fresh water algæ, so called, are severally and collectively in all known cases, the immature but even thus self multiplying germs of higher (or adult) forms of plants and animals, otherwise well known for themselves." Some of the observations leading to these conclusions have been already published, and others are promised in the Proc. A. A. A. S. for 1871. Somewhat similar views were published by Metcalf Johnson, in the Monthly Microscopical Journal. Though not at present received by scientific men, to any extent, these theories must be admitted to be not only ingenious, but suggestive of further investigation.

The Leucocytes.—Prof. Hoppe-Seyler's recent investigations of the white corpuscles of blood, lymph and pus, give somewhat novel and very interesting results. Their original identity is admitted,

but a manifest and permanent differentiation is claimed to occur. By an ingenious experiment, glycogen was detected in lymph-cells. Their glycogenic properties are lost when lymph or white blood-corpuscles become transformed into non-contractile pus-corpuscles, which latter, by excess of oxygen, may undergo fatty degeneration, or, by long immersion in water, other changes due to the presence of oxygen. There also seems to be a close chemical relationship between pus-corpuscles and yeast-cells.

Exogens and Endogens.— At a recent meeting of the Royal Microscopical Society, Prof. T. Dyer expressed himself satisfied of an exogenous growth in *Lepidodendron*, notwithstanding its evidently cryptogamic character. He considered De Candolle's terms exogens and endogens to be already generally abandoned in favor of John Ray's previous names Dicotyledons and Monocotyledons. Recent researches, especially those of Mohl, had proved that Monocotyledons were really not endogenous, but acrogenous; and some cryptogams, as lichens and algæ, as well as Monocotyledons, are regularly exogenous. The speaker regretted that the study of palæontology was so much separated from that of recent organisms. He would like to see fossil and recent specimens not only studied by the same systematists, but arranged side by side in the museums.

A Conspectus of the Diatomaceæ.— This mature and very valuable work by Prof. H. L. Smith, has begun to appear in "The Lens." Diatomists will look with interest for the succeeding numbers.

Photo-micrographs Popularized. — It is to be hoped that microscopists, and others interested in scientific progress, will notice and appreciate the effort now being made, by Mr. C. Meinerth of Newburyport, Mass., to supply "in a cheap and convenient form" really good photographic representations of microscopic objects. Judging from the work already done, Mr. Meinerth's enterprise will prove both entertaining and instructive to the cultivated public.

NOTES.

San Francisco Meeting of the American Association for the Advancement of Science. In our last number we announced that the committee having the matter in charge had decided that the

next meeting of the Association would be held in San Francisco. The only additional information we have received, up to the time of going to press, is in relation to the price of tickets from Omaha, as follows; MEMBERS of the Association will be furnished with a ticket from Omaha to San Francisco and return to Omaha for $63.50 for the round trip, and there is every probability that arrangements will be perfected by which members will be passed at half fare from various points East to Omaha. The committee will undoubtedly issue their circular to members very soon, and we trust that there will be a large attendance, as the meeting will be a most important one in many ways, while the great concessions on the part of the Railroads should induce eastern members to take advantage of the opportunity to visit the, in many points, most interesting state in our country.

THE latest news we have of the Hasler and her corps of scientists, is from Montevideo, Feb. 24th, at which date, Mr. J. H. Blake wrote to us, giving a general account of the expedition to that time, but as his remarks are about the same as those already published in the newspapers we omit the details. Quite extensive collections have been made and several lots already forwarded to Cambridge from the various stopping places which, up to date of the letter, were St. Thomas (Jan. 15), Santa Cruz, Barbadoes, Pernambuco, Rio de Janeiro, and Montevideo (Feb. 24). The most successful dredgings were made off the western side of Barbadoes, in ninety fathoms.

OBITUARY. PROF. THOS. RUSSELL CROSBY, M. D. *Extract from the Minutes of the Dartmouth Scientific Association.*

Whereas, it has pleased our Heavenly Father, in his wise Providence, to remove unexpectedly from among us, by the hand of death, the first President of this organization, our beloved associate, Prof. Thos. Russell Crosby, M. D.

Resolved, that in the death of Prof. Crosby, this Association has lost one who, by the extent of his learning and the excellence of his character, has been a most valuable and highly esteemed member; that to the Association as a body, and to the individuals as members, the loss is that of a friend and brother, and is most deeply felt; and that we tender the family and friends of the deceased our most heartfelt sympathy in their affliction.

Resolved, that a copy of these resolutions be furnished the family and friends, and, moreover, be sent for publication to the NATURALIST, and several other journals.

ANSWERS TO CORRESPONDENTS.

P. L., Boston, Mass.—It is not uncommon for the Muskrat to travel some distance from the water, and even to enter sheds and outbuildings in search of food, especially during mild weather in winter.—J. A. A.

J. O., Poughkeepsie.—The dried puparium you send from Ft. Gibson, is very much like that of *Merodon bardus* Say, figured in "Packard's Guide to Study of Insects," p. 399, fig. 319, *a*.—F. W. P.

A number of letters and notes relating to Entomological matters will have to remain unanswered until Dr. Packard's return from Europe in July.—F. W. P.

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